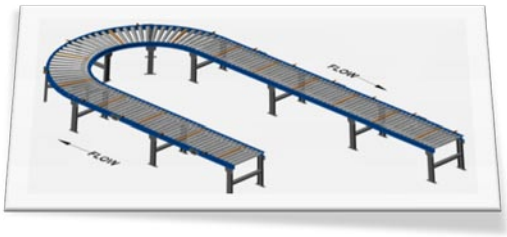
PULSEROLLER

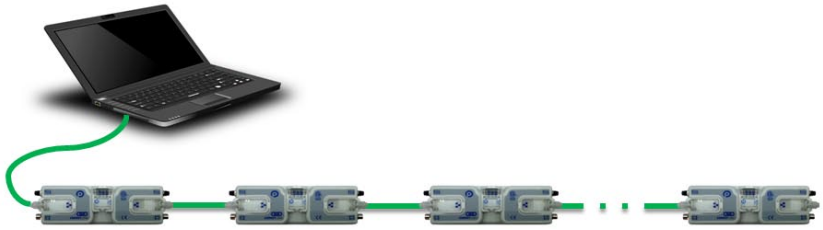
CONVEYLINX

ConveyLinx-Ai2 User's Guide

Version 1.4

October 2017





Publication ERSC-1006

GLOSSARY OF TERMS

ConveyLinx	Conveyor controls architecture based upon modular distributed devices connected via Ethernet network.
ConveyLinx-Ai / ConveyLinx-Ai2	Conveyor control module that is part of the **ConveyLinx** family. Each module can accommodate up to 2 **MDR** conveyor **zones**. The modules allow connection for **Senergy-Ai** platform motor rollers and gear drives.
DHCP	**D**ynamic **H**ost **C**onfiguration **P**rotocol A protocol for assigning **IP** addresses to devices on a network from a pool of available **IP's**. A dynamic **IP** address changes each time the device connects to the network
Hall Effect Sensor	Special sensor embedded within the brushless DC motor of an **MDR** used to provide motor rotor position feedback to the motor controller
M8	This is the type of a particular connector , which has four connector pins and is used on the **ConveyLinx Ai2** modules for both sensor connectors and MDR connectors
LED	**L**ight **E**mitting **D**iode – In the context of this document, **LED's** are used on the **ConveyLinx-Ai2** to provide visual indication of module status
Light / Dark Energized	Term used to describe how the signaling output circuit of a **photo-sensor** is configured when it detects its reflected light. A **photo-sensor** that is **light energized** will activate its output circuit when it detects its reflected light. A **dark energized** photo-sensor will activate its output circuit when it does not detect its reflected light.
Load	A separate (usually wrapped or boxed) object to be transported by the conveyor. The terms **tray, tote,** or **carton** may also be used interchangeably in this document.
MDR	**M**otorized **D**rive **R**oller or **M**otor **D**riven **R**oller - Brushless DC motor and gearbox assembly integrated into a single conveyor roller.
Normally Open / Normally Closed	Control logic terminology to define the state of the output of a Boolean "on" or "off" device. The term specifically describes the state of the output circuit when the device's sensing circuit is un-energized. In the context of **photo-sensors**; a **normally open** wired sensor would have its output circuit energized when it detected its reflected light and its output circuit would be de-energized when it did not detect its reflected light. Conversely a **photo-sensor** wired **normally closed** would energize its output circuit when it did not see its reflected light and it would de-energize its output circuit when it did detect its reflected light.
NPN / PNP	Electronics term that indicates the type of transistor circuit used for a logical input or output for controllers. **NPN** devices will provide a common or ground connection when activated and a **PNP** device will provide a logic voltage connection when activated.
Photo-sensor	A device, mounted near the end of the conveyor **zone** to sense the presence of a **load** on the zone
PLC	**P**rogrammable **L**ogic **C**ontroller – A wide variety of industrial computing devices that control automatic equipment
PWM	**P**ulse **W**idth **M**odulation – a control scheme that utilizes high speed switching transistors to efficiently deliver power in a controlled fashion from ConveyLinx-Ai2 controller to **MDR**.

Retro-reflective / Reflex	Term used to describe the two basic types of **photo-sensors**. **Retro-reflective photo-sensors** utilize a reflective target that must be aligned with the **photo-sensor** such that the light emitted by the photo-sensor is reflected back to it. **Reflex** (or sometimes known as **proximity**) type **photo-sensors** emit light to be reflected back from an object located sufficiently close to the sensor. For both types of **photo-sensors**, when they detect their reflected light source, their signaling output circuit changes state.
IP54	The **IP Code (International Protection Marking)** specifies the device's degree of resistance to intrusions, dust and water. IP54 certified device must be fully protected from splashed water , dust particles and completely protected from contact
RJ-45	**R**egistered **J**ack Style **45** – Standard connector / receptacle format utilizing 8 pin connections. The typical standard for computer network cable connections
Singulation Release	Conveyor control method for zoned controlled conveyor that dictates that when a **zone** is discharging its **load**, the upstream **load** waiting to enter must wait until the discharged **load** is completely clear before it is allowed to enter
Senergy-Ai	PulseRoller brand proprietary motor control platform that provides electronic intelligence inside the motor that can be read by **ConveyLinx-Ai** and **ConveyLinx-Ai2** control modules. The connection from the motor to the controller is via 4-Pin **M8** style connector.
Slave Rollers	A set of non-motorized conveyor rollers mechanically linked to an **MDR**. The **MDR** and slave rollers make up a physical **zone**. All of the **slave rollers** in a **zone** rotate at the same speed and direction as the **MDR** because of their mechanical linkage
TCP/IP	**T**ransport **C**ontrol **P**rotocol / **I**nternet **P**rotocol - **IP** is the protocol which oversees the transmission of information packets from device to device on an Ethernet network. **TCP** makes sure the packets have arrived and that the message is complete. These two protocols are the basic language of the Internet and are often referred to together as **TCP/IP**.
Train Release	Conveyor control method for **zone** configured conveyor that dictates that when a **zone** is discharging, the upstream **zone's load** can move in unison with the discharging **load**.
Zone	A basic (linear or curved) cell of the conveyor consisting of a set of slave rollers driven by one or more **MDR's** and a single **photo-sensor**.
ZPA	**Z**ero **P**ressure **A**ccumulation – Term that describes the conveyor controls and mechanical scheme that will cause loads to queue on a conveyor in discrete **zones** such that loads do not touch each other

SYMBOL CONVENTIONS

This symbol indicates that special attention should be paid in order to ensure correct use as well as to avoid danger, incorrect application of product, or potential for unexpected results

This symbol indicates important directions, notes, or other useful information for the proper use of the products and software described herein.

IMPORTANT USER INFORMATION

ConveyLinx-Ai2 modules contain ESD (Electrostatic Discharge) sensitive parts and components. Static control precautions are required when installing, testing, servicing or replacing these modules. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference any applicable ESD protection handbook. Basic guidelines are:

- Touch a grounded object to discharge potential static
- Wear an approved grounding wrist strap
- Do not touch connectors or pins on component boards
- Do not touch circuit components inside the equipment
- Use a static-safe workstation, if available
- Store the equipment in appropriate static-safe packaging when not in use

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes, and standards

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Insight Automation Inc. does not assume responsibility or liability (to include intellectual property liability) for actual use based on the examples shown in this publication

SUMMARY OF CHANGES

The following table summarizes the changes and updates made to this document since the last revision

Revision	Date	Change / Update
1.0	June 2016	Intial Release
1.1	January 2017	Added Appendix E
1.2	February 2017	Added connection diagrams for Sensor Port Aux I/O
1.3	March 2017	Corrected Figure numbering, clarified Flex Zone and Train release modes
1.4	October 2017	Updated Appendix B – IOX-2 wiring diagrams and schematic

GLOBAL CONTACT INFORMATION

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SUMMARY OF HARDWARE CHANGES

The following table summarizes the changes and updates made to this document since the last hardware revision.

Hardware Revisions		
Revision	**Date**	**Change / Update**
1.0	June 2016	Initial Release

TABLE OF CONTENTS

PREFACE

WHO SHOULD USE THIS MANUAL?

This manual is intended for users who need basic product information and simple application procedures to implement *ConveyLinx-Ai2* modules to control simple linear conveyor.

You should have a basic understanding of electrical circuitry and familiarity with relay logic, conveyor equipment, photo-sensors, etc. If you do not, obtain the proper training before using this product.

PURPOSE OF THIS MANUAL

The purpose of this manual is to:

- Identify the components and ports available on a module
- Provide guidelines for proper installation and wiring
- Provide examples on basic inter-module connections for linear conveyor
- Introduce the *EasyRoll* software tool and provide instructions to configure and modify parameters.

NOT INCLUDED IN THIS MANUAL

Because system applications vary; this manual assumes users and application engineers have properly sized their power distribution capacity per expected motor loading and expected operational duty cycle. Please refer to conveyor equipment and/or motor roller manufacturer's documentation for power supply sizing recommendations.

INTRODUCTION TO CONVEYLINX®

CONVEYLINX® CONCEPT

ConveyLinx control system as applied to conveyor control is a series of individual *ConveyLinx Ai2* modules interconnected via standard Ethernet cabling to form an integrated solution for MDR (Motorized Drive Roller) conveyor functionality. Each *ConveyLinx Ai2* module can accommodate up to 2 Senergy Ai MDRs and 2 photo-sensors to provide control for up to 2 conveyor zones. Each *ConveyLinx Ai2* also includes convenient connectivity ports for upstream and downstream Ethernet network cabling.

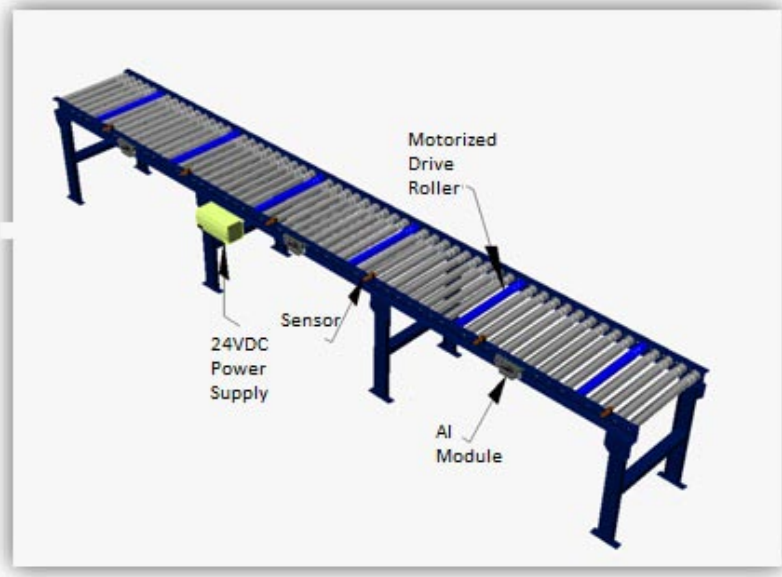
FIGURE 1 - CONVEYLINX® CONCEPT WITH CONVEYLINX-AI2 MODULES

ConveyLinx Ai2 modules can be easily software configured to operate multiple zones of linear conveyor with the *EasyRoll* software. Also, with the *ConveyLinx Easy Roll* software tool; each *ConveyLinx Ai2* module's default configuration can be modified to customize functionality for specific applications.

CONVEYLINX® SYSTEM COMPONENTS

The following are the typical components required for a *ConveyLinx* controlled conveyor installation:

- ✓ *ConveyLinx-Ai2* modules
- ✓ MDRs – one or two per *ConveyLinx-Ai2*
- ✓ Photo-sensors – one or two per *ConveyLinx-Ai2*
- ✓ 24VDC Power Supplies



CONVEYLINX-AI2 MODULE FEATURES

Each individual *ConveyLinx-Ai2* module has the following features:

- ✓ Built-in Ethernet switch
- ✓ Modular M8 (female) style connection ports for photo-sensors
- ✓ Modular M8 (male) style connectors for MDR
- ✓ 24VDC power connection with separate power supplies for logic and motors
- ✓ Context-sensitive multi-color LED indicators
- ✓ Thermal and over-current protection for MDR
- ✓ Automatic light/dark operate detection for photo-sensor inputs
- ✓ Accommodates PNP or NPN type photo-sensor
- ✓ Proportional / Integral (PI) MDR speed regulation
- ✓ Three MDR braking method options
- ✓ Adjustable acceleration and deceleration capability
- ✓ IP54 compliant

CONVEYLINX® CONTROL SYSTEM FEATURES

When one or more *ConveyLinx-Ai2* modules are installed and configured, there are several operational and configurable features of the *ConveyLinx* control system that are accessible by the *EasyRoll* software package. Some of these features are:

- ✓ Single zone to zone zero pressure accumulation (ZPA) control once module is configured.
- ✓ Optional configuration for *Train Release* and *Gap Train Release* modes.
- ✓ Automatic *Flexible Zone Recognition* logic to detect and handle load sizes exceeding the length of one physical zone.
- ✓ Optional configuration for *Look Ahead Slow Down* mode for higher speed applications.
- ✓ Ability to bridge separate Ethernet sub-networks for seamless operation.
- ✓ Ability to designate a *ConveyLinx-Ai2* to be an "Extension" to another *ConveyLinx-Ai2* such that it operates as simple motor controller.

The first sections of this manual will describe in detail the hardware and connectivity requirements for *ConveyLinx Ai2* modules and the software configuration procedures for simple linear conveyor installation.

The latter sections of this manual will describe in detail the usage of the *EasyRoll* software package to gain access to the various optional configuration parameters and utilities.

CONVEYLINX-AI2 MODULE HARDWARE OVERVIEW

ConveyLinx-Ai2 modules are designed to be installed and integrated into the conveyor's mechanical side frame assembly. Please refer to *Appendix A – Module Dimensions* page 97 for module dimensions and mounting details.

The *ConveyLinx-Ai2* module is a controller for up to 2 Motorized Drive Roller (MDR) conveyor zones. Each *ConveyLinx-Ai2* provides connection points for 2 MDR units with their corresponding 2 photo-sensors as well as upstream and downstream network and discreet interconnections to form a complete control system for zoned MDR conveyors.

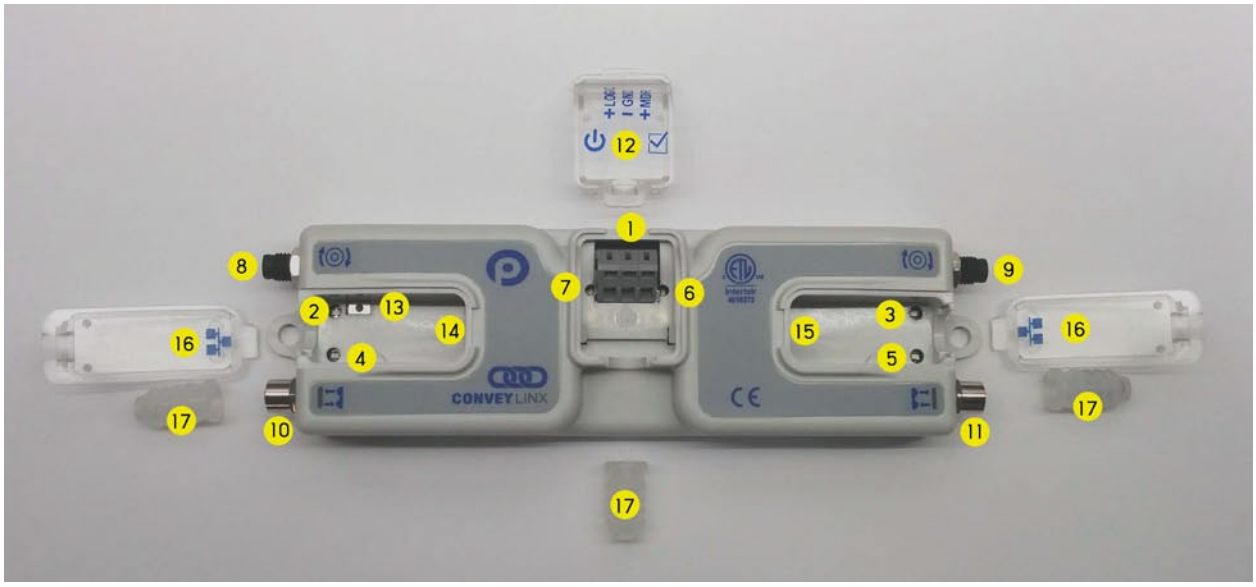


FIGURE 2 – CONVEYLINX-AI2 MODULE HARDWARE FEATURES IDENTIFICATION

Item	Description
1	24VDC Power Terminals with separate connections for Logic and Motors
2 & 3	Motor Left LED & Motor Right LED – Motor status indicators
4 & 5	Left Sensor & Right Sensor Status LED Indicators
6	Module Status LED Indicator
7	Module Power LED Indicator
8 & 9	Motor Left and Motor Right - 4-pin M8 style connector for MDR connection
10 & 11	Sensor Left and Sensor Right – M8 style connector for zone photo-sensor connection
12	RemovableIP54 Power Compartment Cover
13	Module Replacement Button
14 & 15	Link Left and Link Right – RJ-45 style Ethernet network connection between modules
16	Removable IP54 Ethernet RJ-45 Port Compartment Cover – Left and Right
17*	IP54 Protection Shrouds for Ethernet cabling and power wiring

* Indicates items shipped unattached to the module but included in the module's box

The "left" and "right" naming convention for the module ports is based upon facing the module as shown and is not to be confused with direction of product flow on the conveyor. Product flow will be designated as "upstream" and "downstream"

HARDWARE CONNECTIONS

MOTOR LEFT AND MOTOR RIGHT PORTS

Both of these ports utilize a 4-pin M8 male receptacle. Each receptacle is mechanically keyed to assure proper orientation upon plugging in.

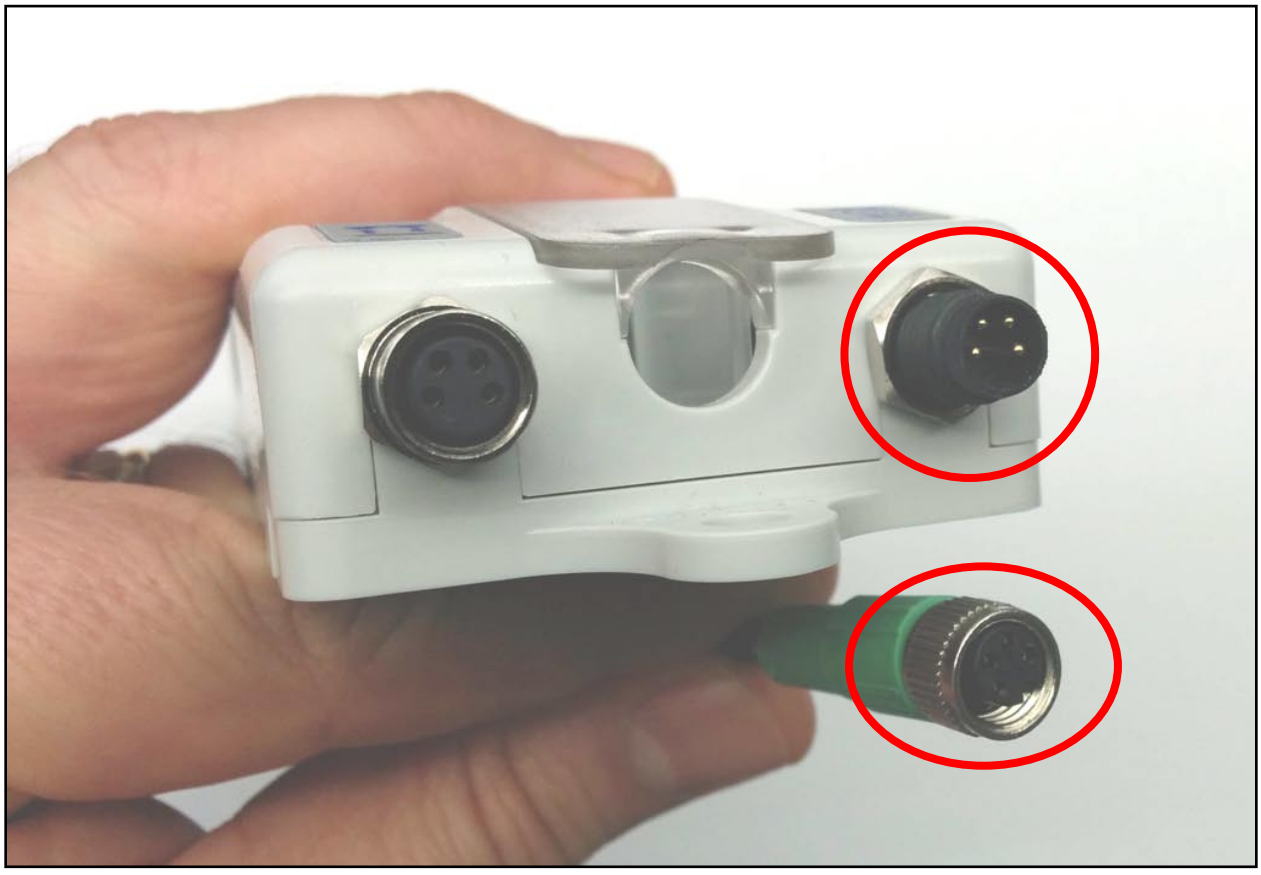


FIGURE 3 - M8 MALE RECEPTACLE AND SENERGY-AI2 FEMALE CONNECTOR

SENSOR LEFT AND SENSOR RIGHT PORTS

Each sensor port is a standard M8 Female receptacle with the following pin-out:

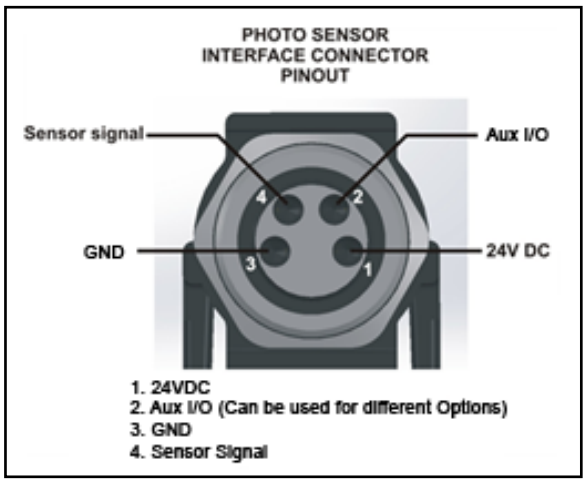


FIGURE 4–CONVEYLINX SENSOR PORT DIAGRAM

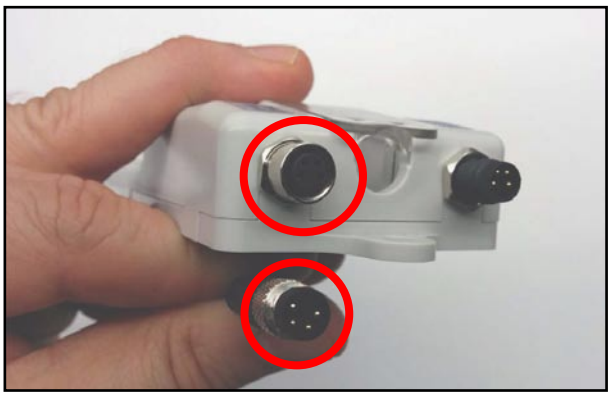


FIGURE 5 – CONVEYLINX-AI2 FEMALE SENSOR PORT AND MATING SENSOR'S MALE CONNECTOR

The signals are defined by the following chart:

Pin	Signal	Description
1	24V DC	Module 24VDC Supply
2	Aux I/O	I/O Signal – Function configured with *EasyRoll* software
3	GND	Module DC Common
4	Sensor Signal	Logical Input for Sensor's state output – Auto detect for NPN or PNP

ELECTRICAL CONNECTIONS FOR SENSOR PORT AUX I/O

When connecting to either Sensor port with an M8 connector to access Pin 2 signal; it depends on whether you are using Pin 2 as an input or output that will determine the electrical connection.

See* Sensor Port Aux I/O Pin 2 Usage *beginning on page 85 for details on using EasyRoll to configure the function of Sensor Port Pin2

AUX I/O PIN2 AS INPUT

When the Aux I/O Pin 2 is configured as an input, the circuit is NPN/PNP auto-sensing. The signal can be connected to either +24V or 0V to operate as shown in Figure 6.

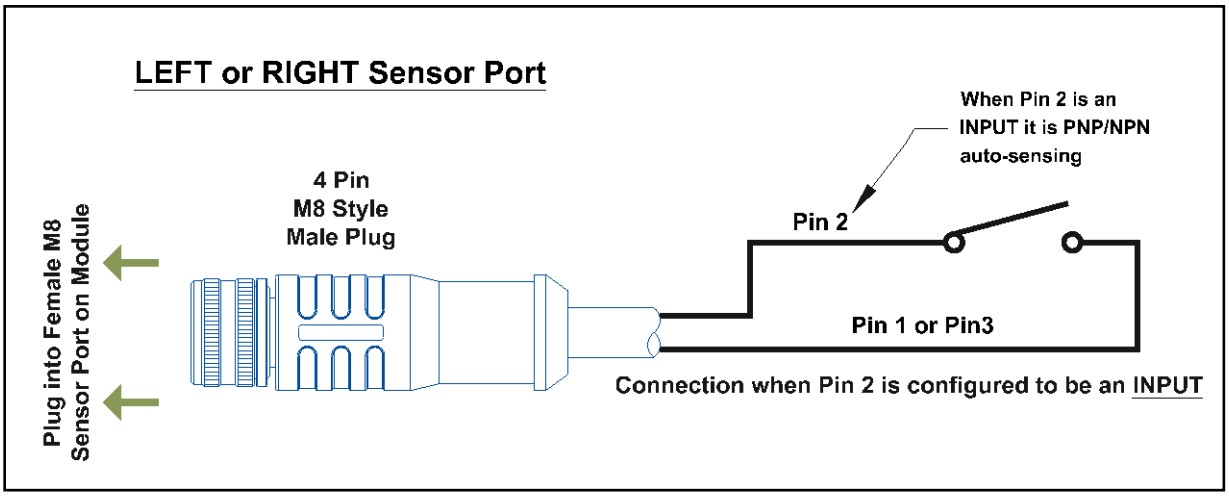


FIGURE 6 - AUX I/O PIN 2 INPUT CONNECTION DIAGRAM

Because the auto-sensing circuit requires a nominal voltage in order to operate, there will be some small amount of leakage current possible between Pin 2 and Pin 3 (GND). Please use caution if you connect a load between Pin 2 and Pin 3.

AUX I/O PIN 2 AS OUTPUT

When the Aux I/O Pin 2 is configured as an output, the circuit is NPN only and requires the load to be connected to Pin 1 (+24V) as shown in Figure 7.

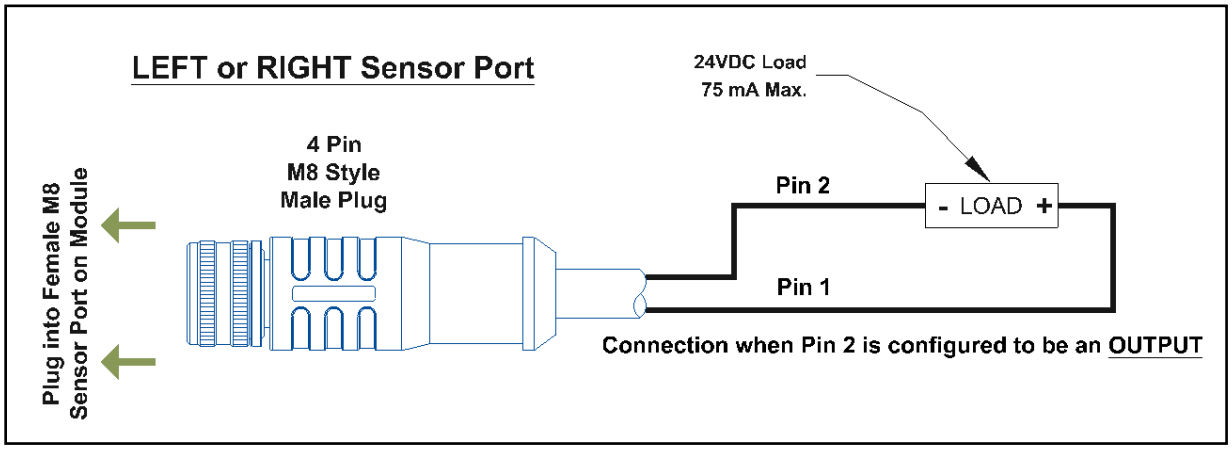


FIGURE 7 - AUX I/O PIN2 OUTPUT CONNECTION DIAGRAM

ETHERNET LEFT AND ETHERNET RIGHT PORTS

Both of these ports are standard RJ-45 jacks conforming to standard Ethernet connection pin-out. In order to maintain IP54 rating; Ethernet cables need to be equipped with protective shrouds. Figure 8 shows Ethernet cables installed using shrouds to protect the RJ-45 connectors on the Ethernet cables. Each module is shipped with 3 shrouds.

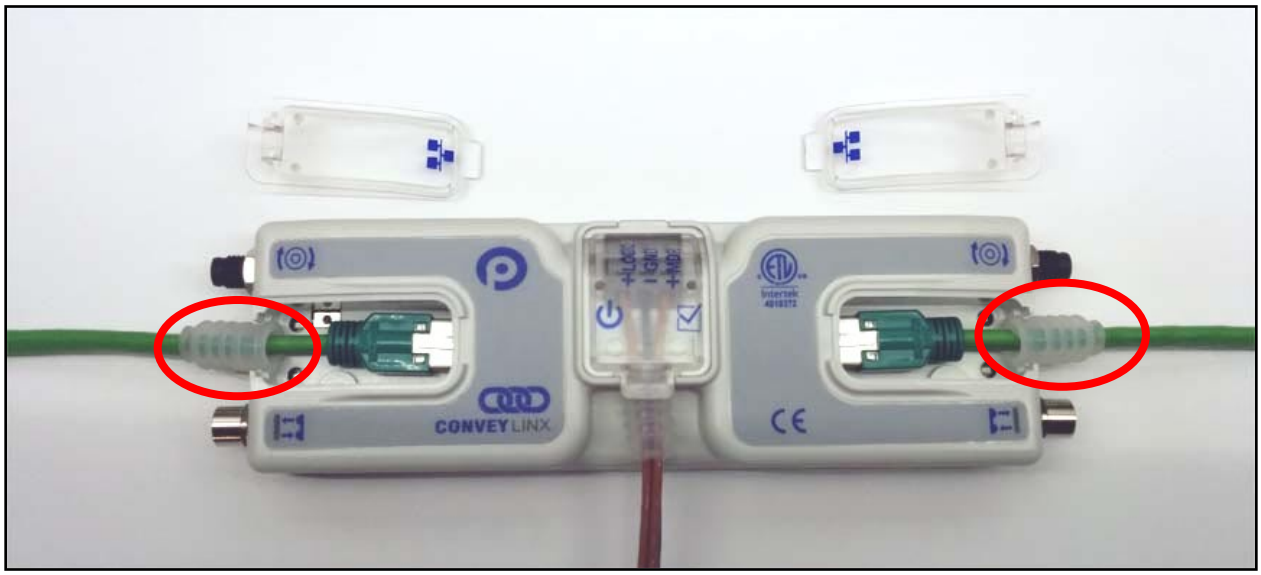


FIGURE 8 – CONVEYLINX-AI2 WITH LEFT & RIGHT ETHERNET CABLES (COVERS REMOVED)

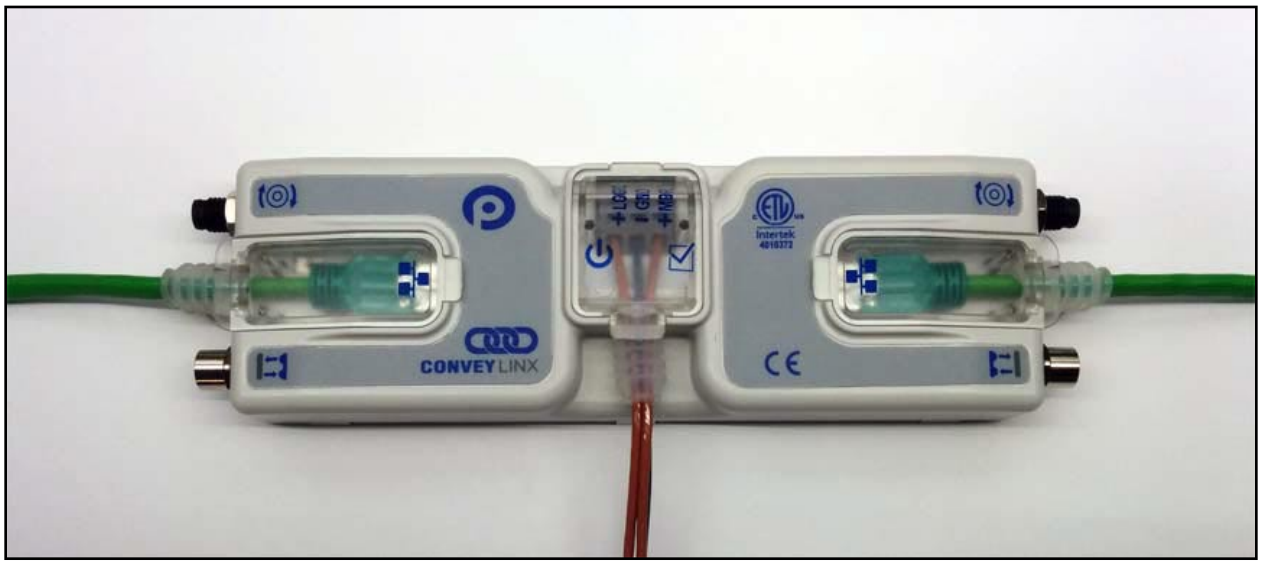


FIGURE 9 - ETHERNET CABLES CONNECTED WITH COVERS ATTACHED

IP54 protective shroud requires a special tool to properly install the shroud onto the RJ-45 connector. Figure 10 shows Phoenix Contact item 2891547 FL IP 54 Assembly Tool.

This tool must be purchased separately

FIGURE 10 - PHOENIX CONTACT ETHERNET SWITCH 2891547 FL IP 54 ASSEMBLY TOOL

FIGURE 11 - PROTECTIVE SHROUND PLACED ON TOOL

FIGURE 12 - SHROUND STRETCHED WITH TOOL

FIGURE 13 - INSERTING RJ-45 END THROUGH SHROUD

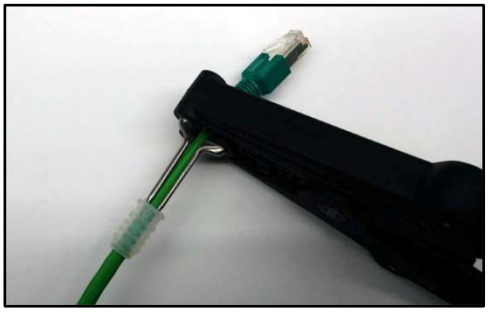


FIGURE 14 - SHROUD REMOVED FROM TOOL PINS

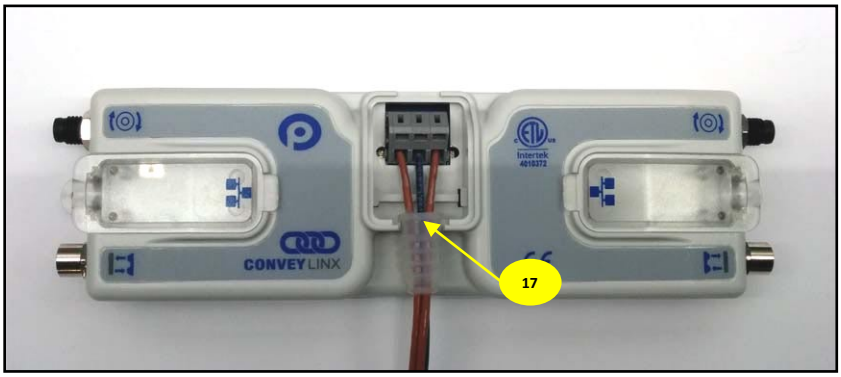
All Ethernet cables for connections between modules are recommended to be shielded. Failure to use shielded cables may result in data loss and unexpected results. Shown above are Ethernet cables with sealing shrouds required for IP54 compliance.

POWER CONNECTIONS

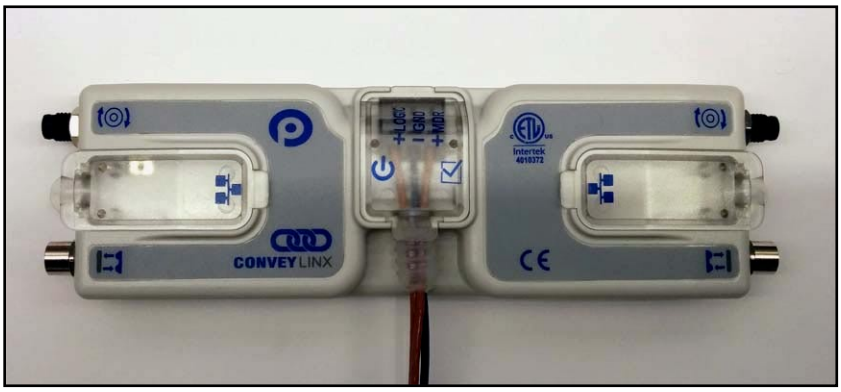
IP54 INSTALLATION

Item 17 as depicted in Figure 2 may be unattached to the module when shipped and are included in the module's shipping box. These items are used to maintain an IP54 installation of the power and Ethernet wiring.

Power wires are fed through the protective shroud (Item 17). The wire terminals are standard cage-clamp style.



Once wiring has been completed the power wiring compartment is then sealed by snapping into place the Power Compartment Cover (Item 18).



LOGIC AND MDR POWER

The *ConveyLinx Ai2* module is designed to allow for separate power connections for module logic and motor power so that these can be powered by separate power supplies. For example, the motor power supply can switched off by an emergency stop control system so that all motors have power removed. With the motor power separately switched off; the logic power supply can remain on so that the module's communications can remain active and report status to networked supervisory control system(s). Figure 16 shows a diagram for separate logic and MDR power supplies and Figure 15 shows a diagram for a single power supply for both logic and MDR power. Note that powering the MDR terminal also powers the Logic.

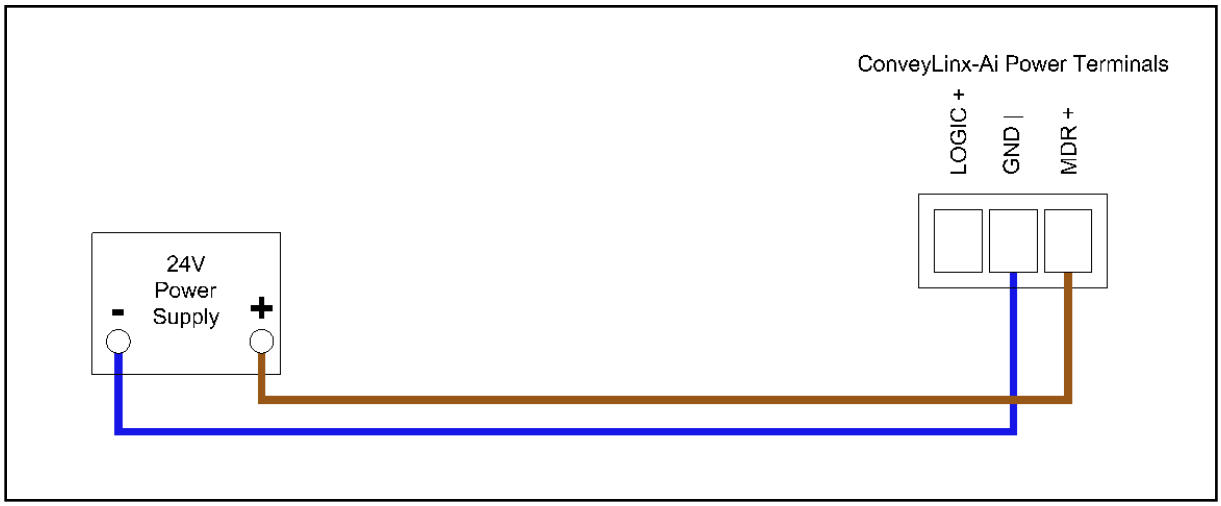


FIGURE 15 - CONNECTION FOR SINGLE MDR AND LOGIC POWER SUPPLY

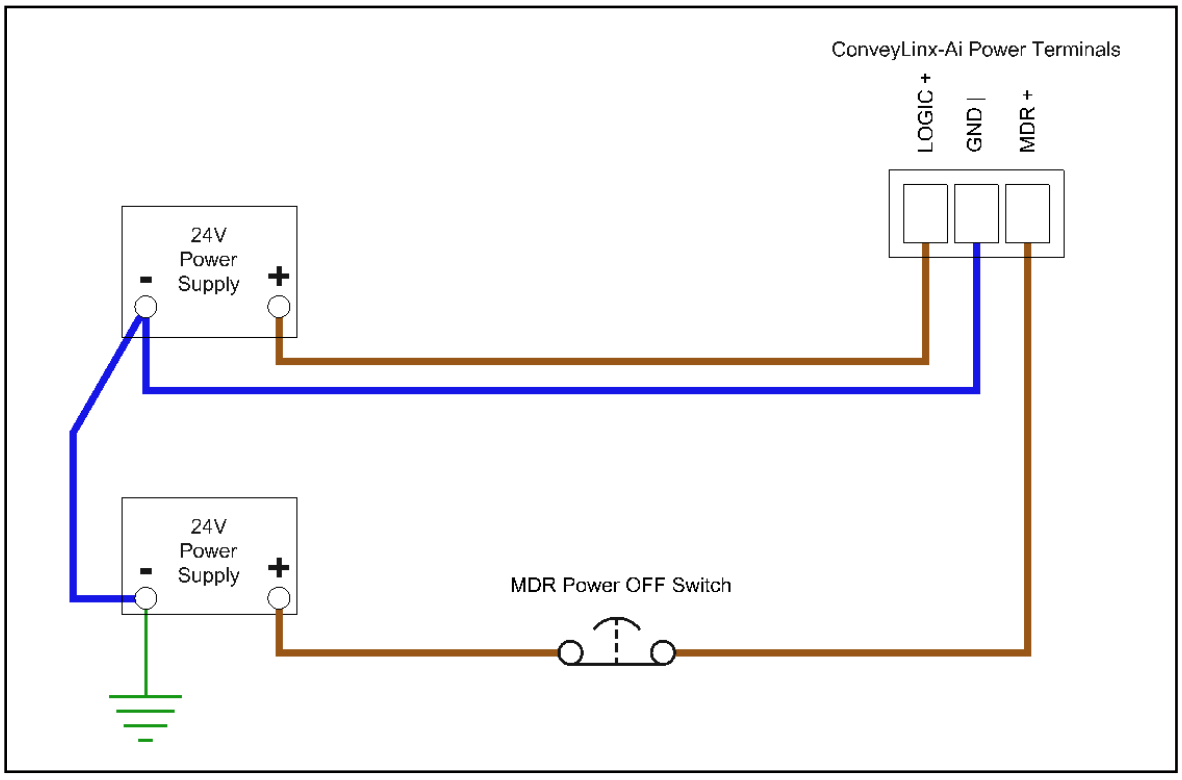


FIGURE 16 - TYPICAL CONNECTION FOR SEPARATE MDR AND LOGIC POWER SUPPLIES

Power Supply Common Grounding

Whether logic and MDR are powered together or separately; the DC common ("-") connections on all power supplies should be connected together. One of the power supplies should have its DC common connected to ground. Avoid connecting more than one power supply DC common to ground because this can lead to unintended grounding loops. Figure 17 and Figure 18 show single and separate power supply connections respectively and their DC common connections and grounding connection.

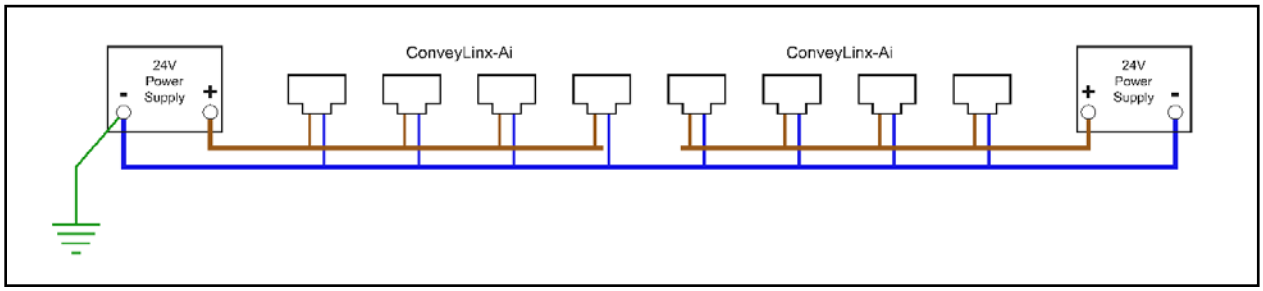


FIGURE 17 – SINGLE POWER SUPPLY CONNECTION WITH DC COMMONS TIED TOGETHER AND TO GROUND

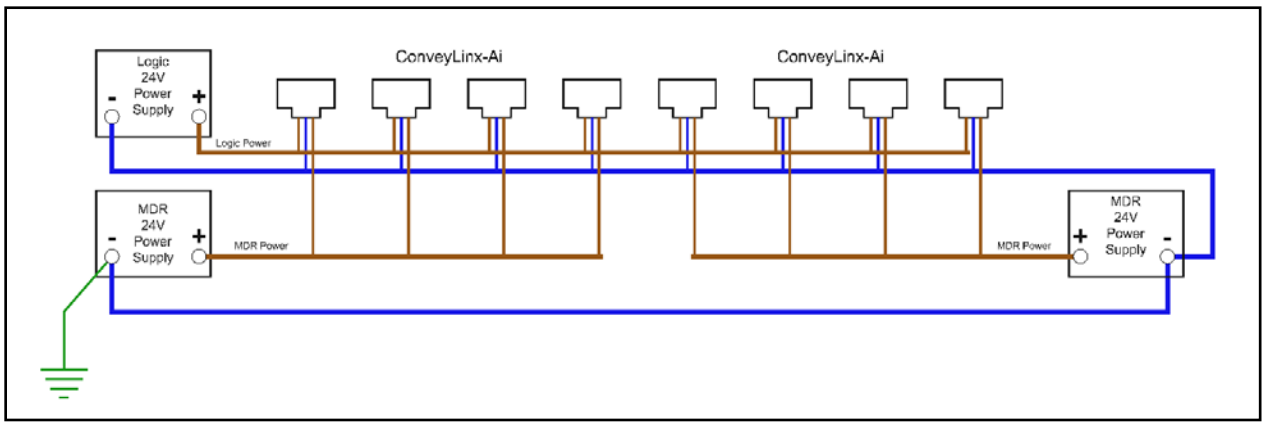


FIGURE 18 - DUAL POWER SUPPLY CONNECTION WITH DC COMMONS TIED TOGETHER AND TO GROUND

Please refer to Appendix E – Power Supply Loading on page 113 for additional information

This document assumes the user is aware of MDR power requirements for the application and that the user and/or installer have properly sized 24VDC power supplies and wiring based upon all applicable codes and standards. This document also assumes installation will follow proper equipment grounding practices. "DC common or -"**on all power supplies should always be connected to ground.** Improper power supply sizing and/or improper grounding practices may produce unexpected results.

CONNECTIONS FOR LINEAR CONVEYOR

For linear conveyor operation, *ConveyLinx-Ai2* modules are designed to undergo an Auto-Configuration Procedure which is performed utilizing the *EasyRoll* software tool.

Further description and application examples of Ethernet networked solutions are included in separate Insight Automation publication *ConveyLinx Ai Developer's Guide* (publication *ERSC-1510*).

Before the Auto-Configuration Procedure can be performed; each individual *ConveyLinx-Ai2* module needs to have its associated MDR's and photo-sensors connected in the proper way for expected operational results.

In general, each *ConveyLinx-Ai2* module detects which *Sensor* ports have a device connected and will use this to determine its specific configuration once it has been instructed to self-configure by the Auto-Configuration Procedure.

Before starting to configure your system to operate, each MDR and photo-sensor needs to be properly connected to the *ConveyLinx-Ai2* modules mounted on the conveyor. *ConveyLinx-Ai2* modules will determine how to operate based upon how the photo-sensors and MDR's are connected.

A single *ConveyLinx-Ai2* module can operate as a:

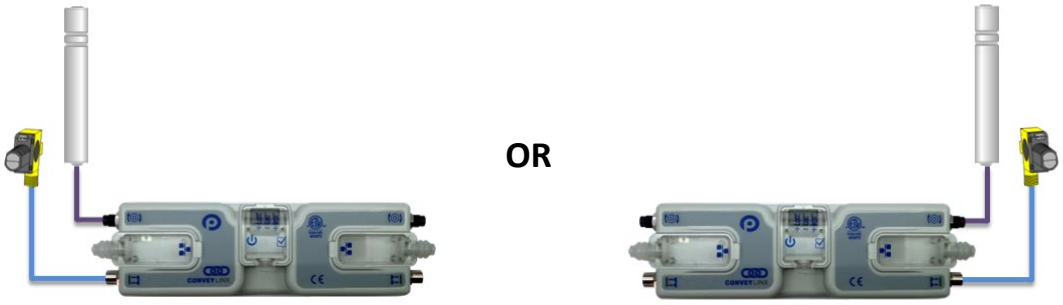
- 2 zone controller with 2 MDR's and 2 photo-sensors
- 1 zone controller with 1 MDR and 1 photo-sensor
- 1 zone controller with 2 MDR's and 1 photo-sensor

The following examples illustrate these connections.

EXAMPLE 1 –TWO ZONE CONTROLLER

In this example an MDR and photo-sensor is connected to both the Left and Right group of ports. The module will control the 2 MDRs as independent logical conveyor zones.

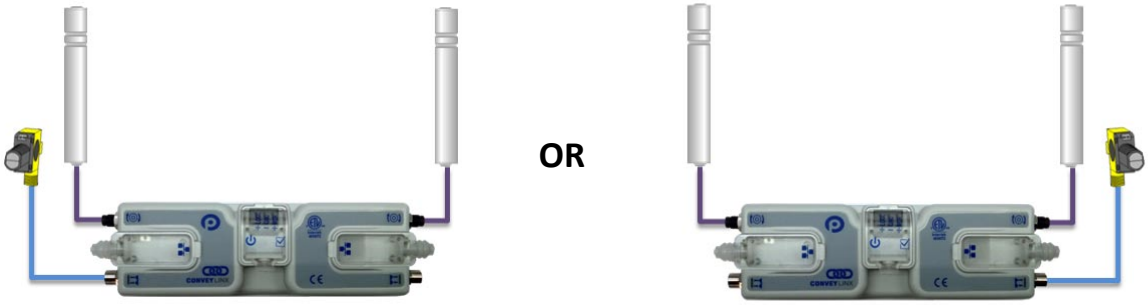
EXAMPLE 2 – SINGLE ZONE CONTROLLER



OR

In this example, a single MDR and photo-sensor is connected to either the Left or Right group of ports. The module controls the MDR as a single independent logical conveyor zone.

EXAMPLE 3 – DUAL MDR SINGLE ZONE CONTROLLER

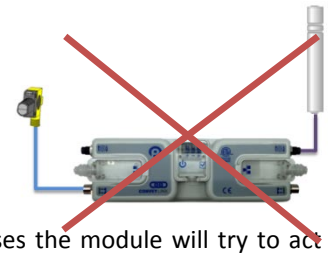


OR

In this case the *ConveyLinx-Ai2* module will control 2 MDR's in tandem and operate as a single zone with a single photo-sensor connected to either the Left or Right port. This configuration is typical for belted zones used particularly on inclined conveyors which require the added torque of a second MDR to accommodate the conveying load.

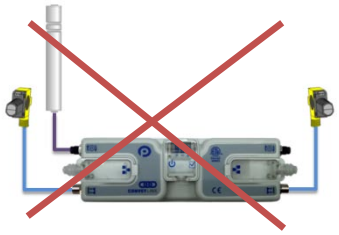
INVALID CONFIGURATION EXAMPLES

Because the *ConveyLinx-Ai2* module determines its self-configuration intention by how photo-sensors are connected; it is possible to connect photo-sensors and MDR's in invalid ways that will produce unexpected results.



OR

In these cases the module will try to act as a Single zone conveyor control, but the MDR's are not plugged into same Left/Right port group as the photo-sensors.



OR

In these cases the *ConveyLinx-Ai2* will try to act as a two-zone conveyor control but only one MDR is connected.

These invalid configurations will not cause the Auto-Configuration function to fail. The user will only experience incorrect operation and/or unexpected results.

MOTOR DIRECTION DEFINITION

The *ConveyLinx-Ai2* module uses a Clock-Wise (CW) and Counter Clock-Wise (CCW) motor rotation definition. The reference for this distinction is based upon viewing the MDR from the cable exit end of the roller as depicted below in Figure 19.

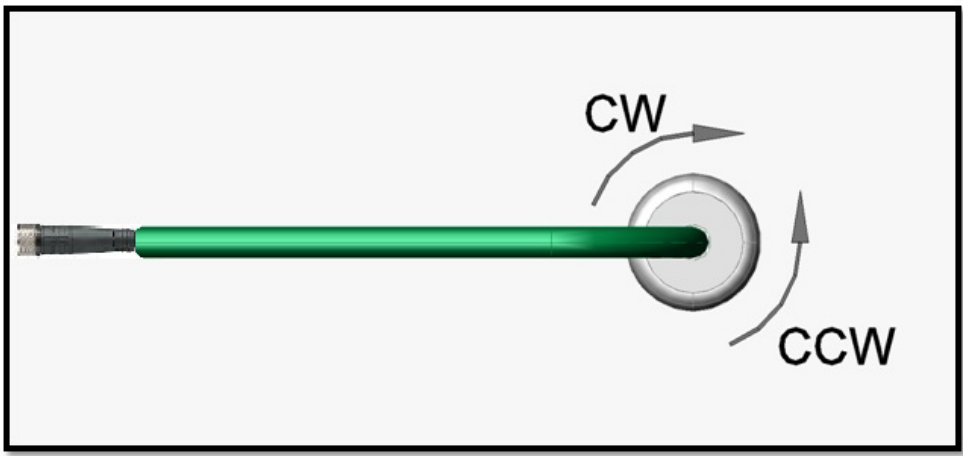


FIGURE 19 - MOTOR ROTATION DIRECTION CONVENTION

STATUS INDICATORS

ConveyLinx-Ai2 module status is indicated by several LED's. All LED's with the exception of the Ethernet Link and Activity LEDs are multi-coloured and context sensitive. The following chart indicates the various meanings of all *ConveyLinx-Ai2* LED indicators. Please refer to Figure 2 on page 17 for the item number locations on the module. By definition *Blinking* is approximately ½ second on/off cycle and *Flashing* is approximately ¼ second on/off cycle.

COMMUNICATIONS

Indicator	Item	LED State	Description
Ethernet Left Link & Ethernet Right Link		OFF	No connection established
		Solid Green	Connection is established
		Blinking Green	When data transmission activity is occurring

NETWORK & MODULE FUNCTION

Indicator	Item	LED State	Description
Module Status	6	*Blinking* Red	*ConveyLinx Ai2* is starting task processes
		Blinking Green	*ConveyLinx Ai2* is ready
		Flashing Green & Blinking Red	Failsafe Mode
		Flashing Red	Auto Configure Mode is active
		Blinking Amber	Connection to peer lost or performing firmware upgrade check
		Solid Amber	Firmware upgrade in progress

MOTORS

Indicator	Item	LED State	Description
Motor Left & Motor Right	2 & 3	OFF	Motor is not running and no faults detected
		Solid Green	Connection is established
		Solid Red	• If Motor is running, indicates current limit • If Motor is stopped, indicates motor is not connected properly or is overheated • Power supply is under 18V or above 30V
		Blinking Red	Motor is overloaded and *ConveyLinx-Ai2* is limiting current to reduce temperature
		Flashing Red	Motor short circuit detected between at least two of the phase windings

SENSORS

Indicator	Item	LED State	Description
Sensors	4 & 5	Solid Amber	ConveyLinx Ai2 is booting up
		Solid Green	Sensor Input energized
		Solid Red	Sensor health signal
		Blinking Red	Zone Jam or missing sensor
		Flashing Red	Network Stop Condition

POWER

Indicator	Item	LED State	Description
Power	7	Solid Blue	Power supply for both logic and motors is connected
		Blinking Blue	Motor's power is under 18V

AUTO-CONFIGURATION OF LINEAR CONVEYOR

The purpose of Auto-Configuration for networked *ConveyLinx* controls is to provide a simple and easy procedure for linear conveyor system commissioning. The Auto-Configuration of Linear Conveyor feature of *ConveyLinx* requires the use of the *EasyRoll* on a PC connected to the most upstream module of the linear network.

LINEAR CONVEYOR DEFINITION

Auto-Configuration is only applicable to a **Linear Conveyor** arrangement. A Linear Conveyor arrangement is defined as a single uninterrupted path of conveyor with no merge or diverts mechanisms. A Linear Conveyor can include curved sections, but the flow of cartons or totes on the conveyor is continuous from in-feed zone to discharge zone.

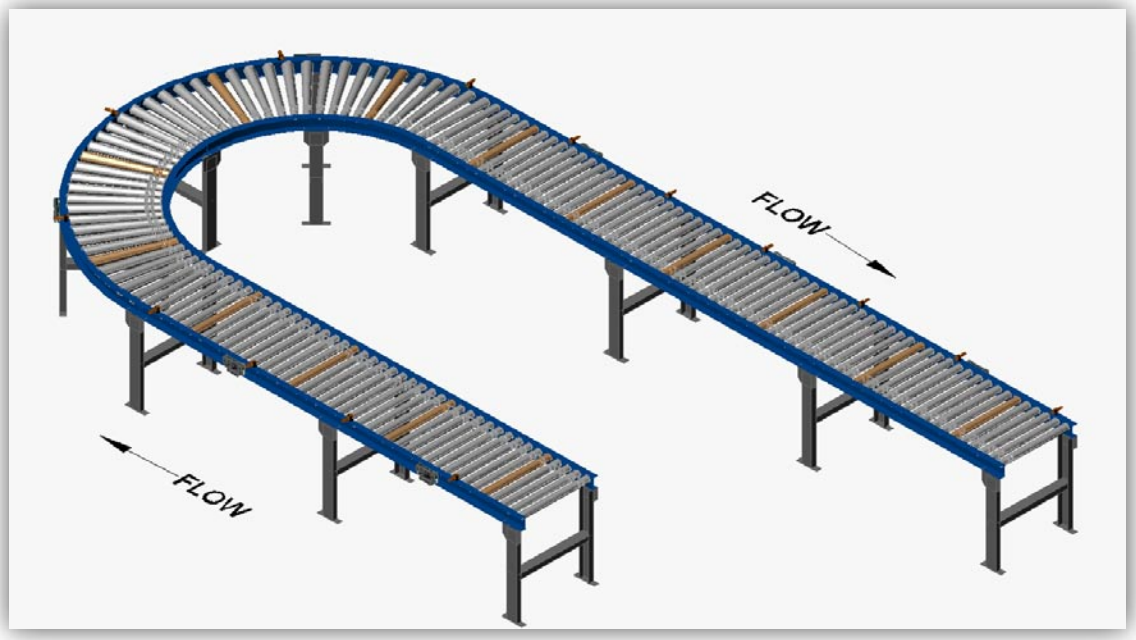


FIGURE 20 - SIMPLE LINEAR CONVEYOR EXAMPLE

A networked *ConveyLinx* solution is capable of controlling more complex conveyor paths that include diverting and merging equipment. However, this requires configuration with a PC and software. Please refer to the Pop-up self-help within the *EasyRoll* for details on PC based configuration.

INSTALLING EASYROLL TOOL ON YOUR PC

The files for *EasyRoll* will be typically sent or downloaded in a compressed (i.e. ".zip") format. Once you have extracted the contents of the compressed file; the result will be a folder named with the format "EasyRoll_Vx_nn" where x is the main version number and the nn is the revision level. Inside this folder is a file named "Setup.exe". Double click this file to begin the install procedure. *EasyRoll* installs like any standard Windows application and you will be prompted for typical Windows prompts. By accepting the defaults for the prompts; *EasyRoll* will install on your local *Operating System* drive under the " \Program Files (x86)\Industrial Software\EasyRoll\" or " \Program Files\Industrial Software\EasyRoll\".

CONVEYLINX ETHERNET DEFINITION

Please refer to *Appendix C–Configuring PC for Ethernet Subnets* for pre-requisite information on understanding Ethernet network I.P. addresses and Subnet concepts. Further description in this section assumes you have a general knowledge level of I.P. addressing and subnets.

All *ConveyLinx-Ai2* modules communicate over Ethernet network and use TCP/IP based protocols for normal function. All TCP/IP protocols require that each device on a network have a unique I.P. address assigned to it in order to function properly.

An I.P. address is in the format of: `AAA.BBB.CCC.DDD` where `AAA`, `BBB`, CCC, and DDD are numerical values between 0 and 255.

For the purposes of *ConveyLinx;* the `AAA.BBB.CCC` portion of the I.P. address taken together is defined as the ***Subnet***. The DDD value of the address is defined as the ***Node***.

For example; if a *ConveyLinx-Ai2* has an I.P. address of "192.168.25.20" then its *Subnet* address is "192.168.25" and its *Node* is "20"

At the factory, each and every *ConveyLinx-Ai2* module is assigned a temporary I.P. address that is used by automated testing equipment and fixtures so that every *ConveyLinx-Ai2* is verified prior to shipment. When a *ConveyLinx-Ai2* is taken "out of the box" it will still have this I.P. address stored in its memory.

When the *Auto-Configuration Procedure* is initiated; one of the many things that occur is that each module is automatically assigned a new I.P. address. This I.P. address for all modules is determined by the ***Subnet*** of the I.P. address already stored inside whichever *ConveyLinx-Ai2* is selected as the *Auto Configuration Master*. Even if all downstream modules from the *Auto Configuration Master* have the same or different *Subnet* or *Node* values; these downstream modules will have their *Subnet* changed to the existing *Subnet* of the *Auto Configuration Master*. Furthermore, when the *Auto Configuration Procedure* occurs; the *Auto Configuration Master* will also have its ***Node*** value changed to **20**. All downstream *ConveyLinx-Ai2* modules will then have their *Node* values automatically set beginning with 21.

Figure 21 shows 4 *ConveyLinx-Ai2's* are installed "out of the box" onto the conveyor. Once the *Auto Configuration Master* is identified and the *Auto-Configuration Procedure* is performed; all 4 *ConveyLinx-Ai2's* will have their I.P. address configured as shown in Figure 22.

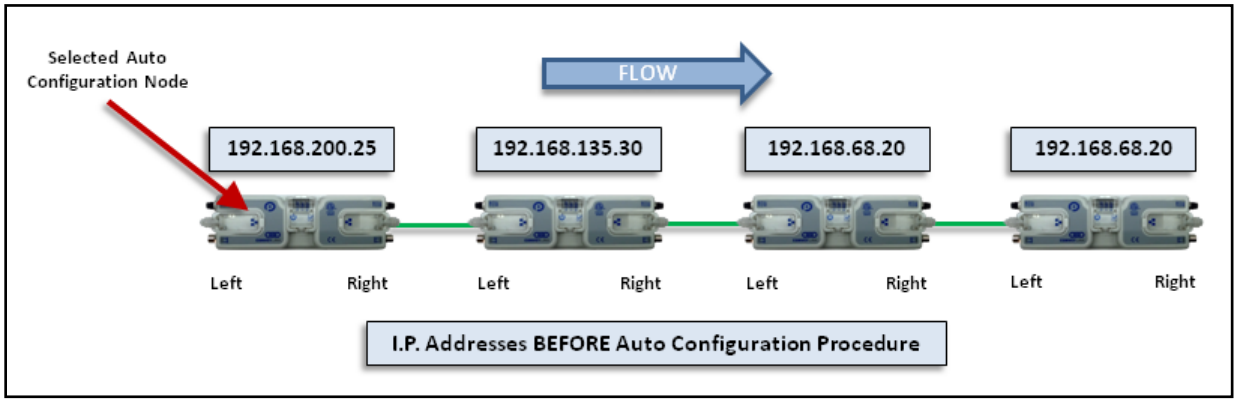


FIGURE 21 - IP ADDRESSES BEFORE AUTO-CONFIGURATION

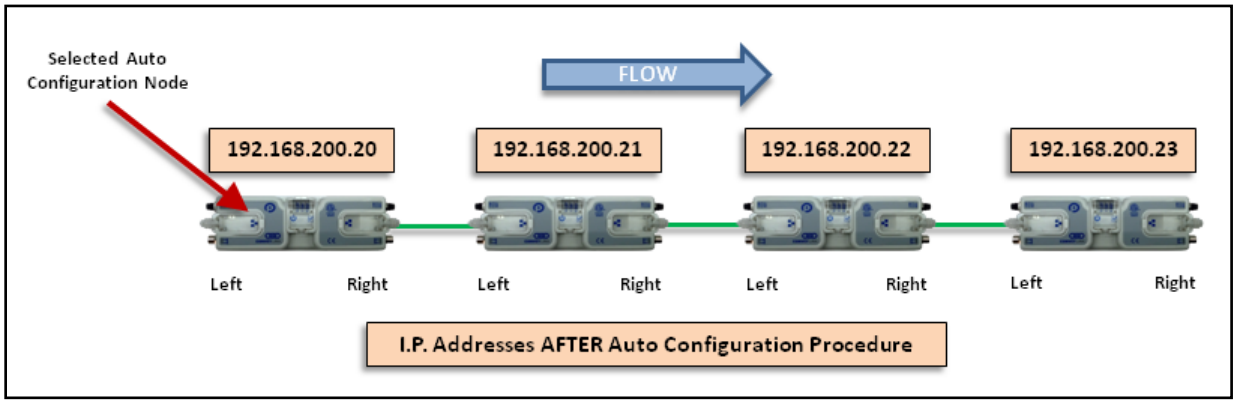


FIGURE 22 - IP ADDRESSES AFTER AUTO-CONFIGURATION

The *Auto-Configuration Procedure* will assign *Nodes* up to and including *Node 240*. Therefore each *Subnet* is limited to 220 *ConveyLinx-Ai2 Nodes.*

CONNECTING YOUR PC TO *CONVEYLINX* NETWORK

Using an Ethernet cable, connect your PC's Ethernet port to the *Auto-Configuration Master* as shown below in Figure 23

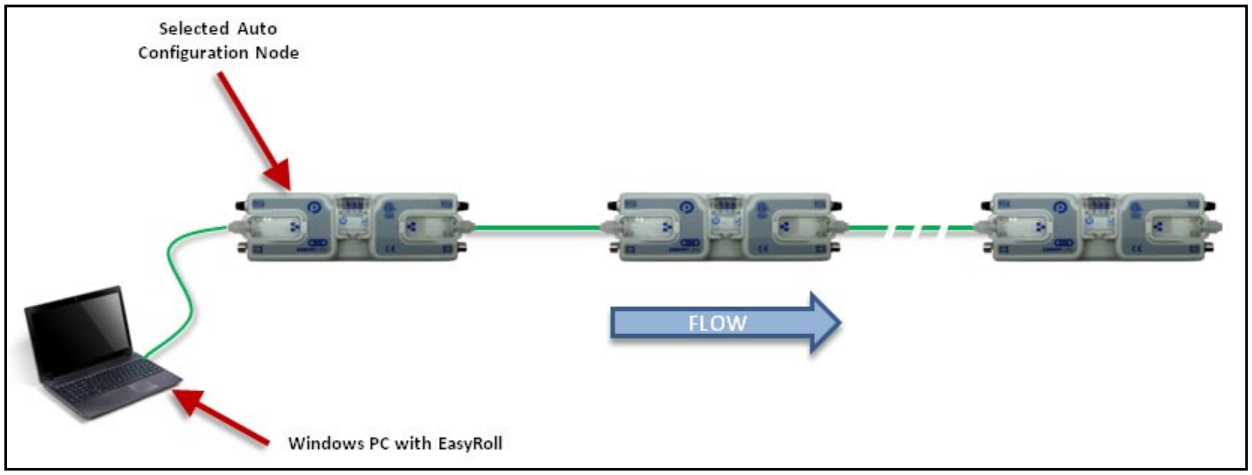


FIGURE 23 - INITIAL PC CONNECTION TO CONVEYLINX SUBNET

It is highly recommended to connect the PC directly to the ConveyLinx network. Avoid trying to connect via Ethernet switches or wireless router/switches. If a wireless switch is not setup properly then the Discover Feature will not work. Also ensure that network firewall is turned off for proper discovery.

AUTO-CONFIGURATION PROCEDURE

The direction of flow of the conveyor dictates how to begin the Auto-Configuration procedure. The *ConveyLinx Ai2* module located at the most upstream or in-feed end of the conveyor is defined as the ***Auto-Configuration Node***. The Auto-Configuration procedure is initiated from the *Auto-Configuration Node*. Because of its physical location on the conveyor path and physical location in the Ethernet connection chain; the *Auto-Configuration Node* will automatically connect to all downstream modules and set their I.P. address for communication. Then the routine automatically sets the direction of flow. The following is the procedure to follow:

1. *Start EasyRoll V4.11 or higher* and press F2. In the pop-up panel select "Network Services" and click "Discover".

2. When the ConveyLinx Ai2 modules appear in the module table, select the ones that you want to configure and click "ConveyLinx tree" as shown in Figure 24.

3. When the topology is drawn, select the ConveyLinx Ai2 module from which you want to configure the line and click "Auto-Configure from selected node" as shown in Figure 25.

4. This starts the Auto-Configuration procedure which will spread to all subsequent *ConveyLinx Ai2* modules and configure the entire line.

In order for the Auto-Configuration to work properly, all loads, totes, product, containers, cartons, etc. must be removed from the entire conveyor path and all photo-sensors must be aligned and adjusted so that none are detecting that their respective zone is occupied. Failure to meet these conditions will produce unexpected results.

Please note that number of modules on a single Subnet is limited to 220.

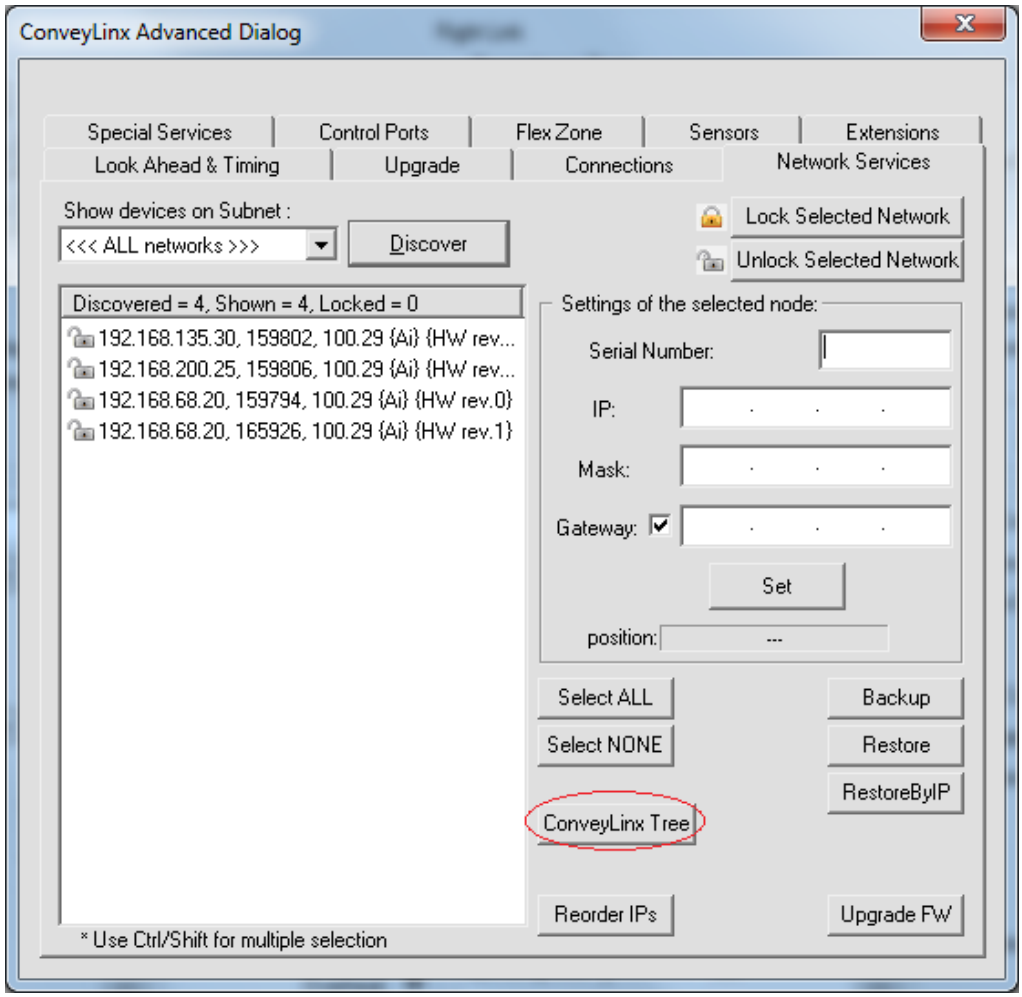


FIGURE 24 - DISCOVER PROCEDURE ON CONVEYLINX-AI2 MODULES

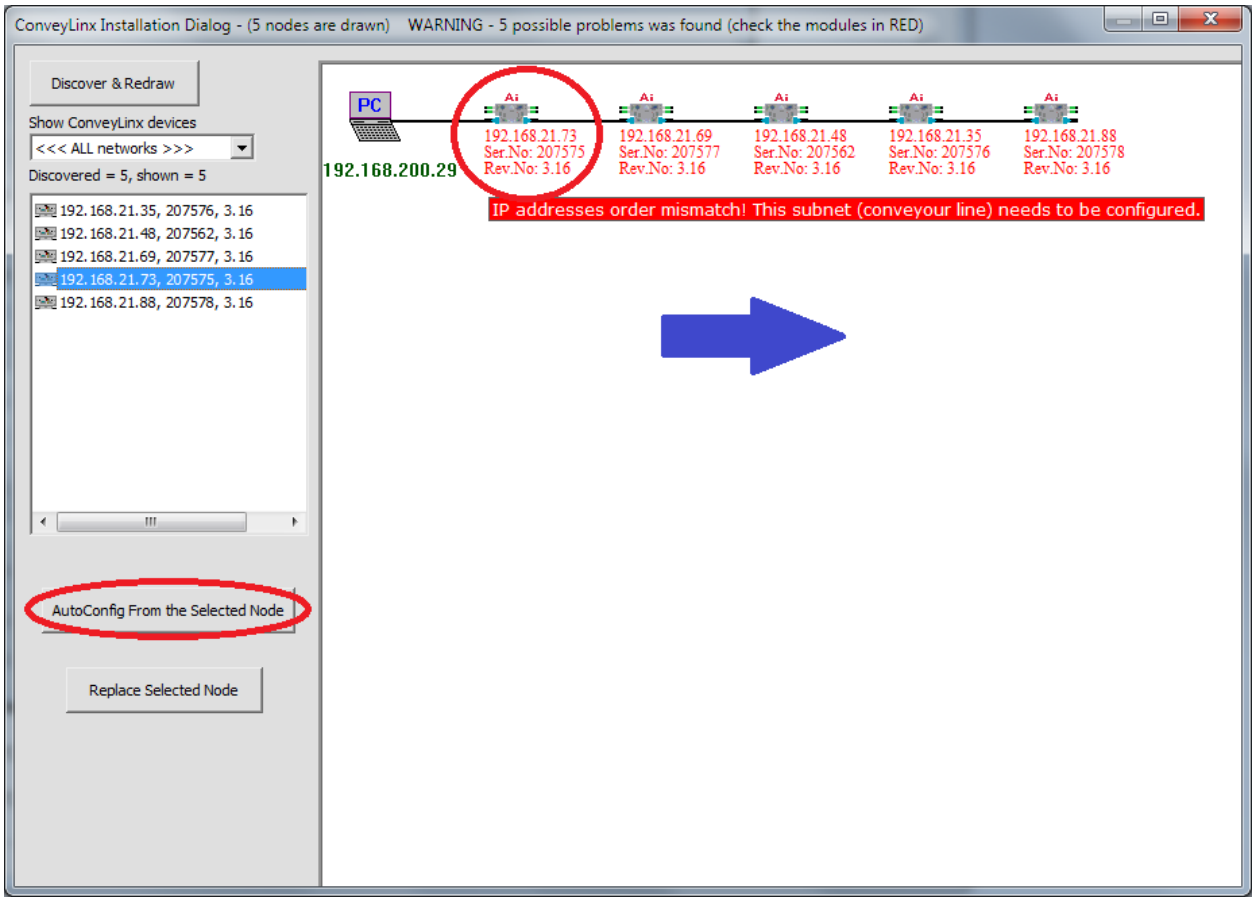


FIGURE 25 – TOPOLOGY VIEW AND INITIATING AUTO-CONFIGURE FROM THE SELECTED NODE

Note that the detail information in the topology view for each module is shown in RED when the module is un-configured. You can also select the module graphic from the topology view and right click to show the context menu and initiate the Auto-Configuration from there as shown in Figure 26.

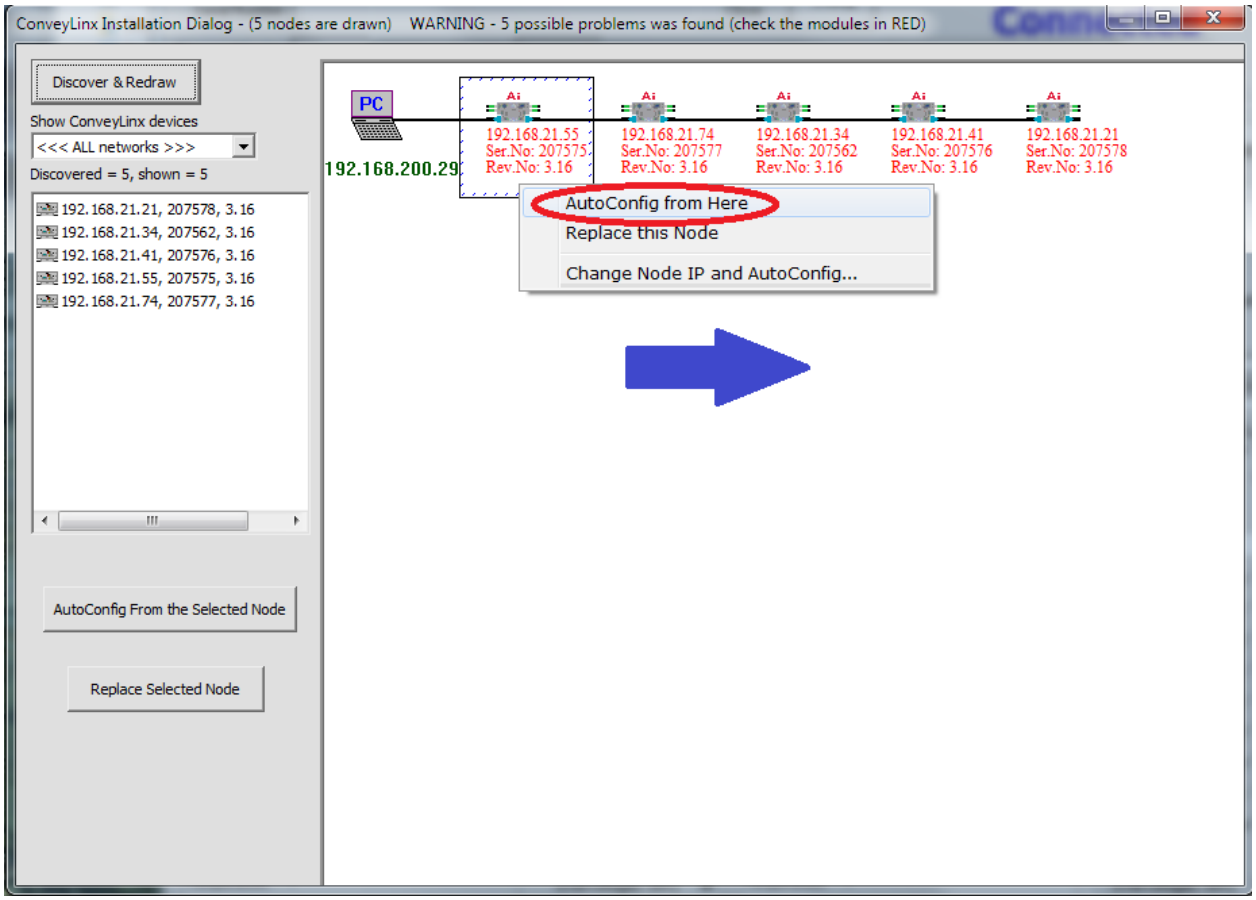


FIGURE 26 - AUTO-CONFIGURE BY SELECTING NODE IN THE TREE VIEW

The selected node for Auto-Configuration does not have to be the first module that is connected directly to the PC. The module at the other end of the detected line can also be selected as the Auto-Configuration master as shown in Figure 27.

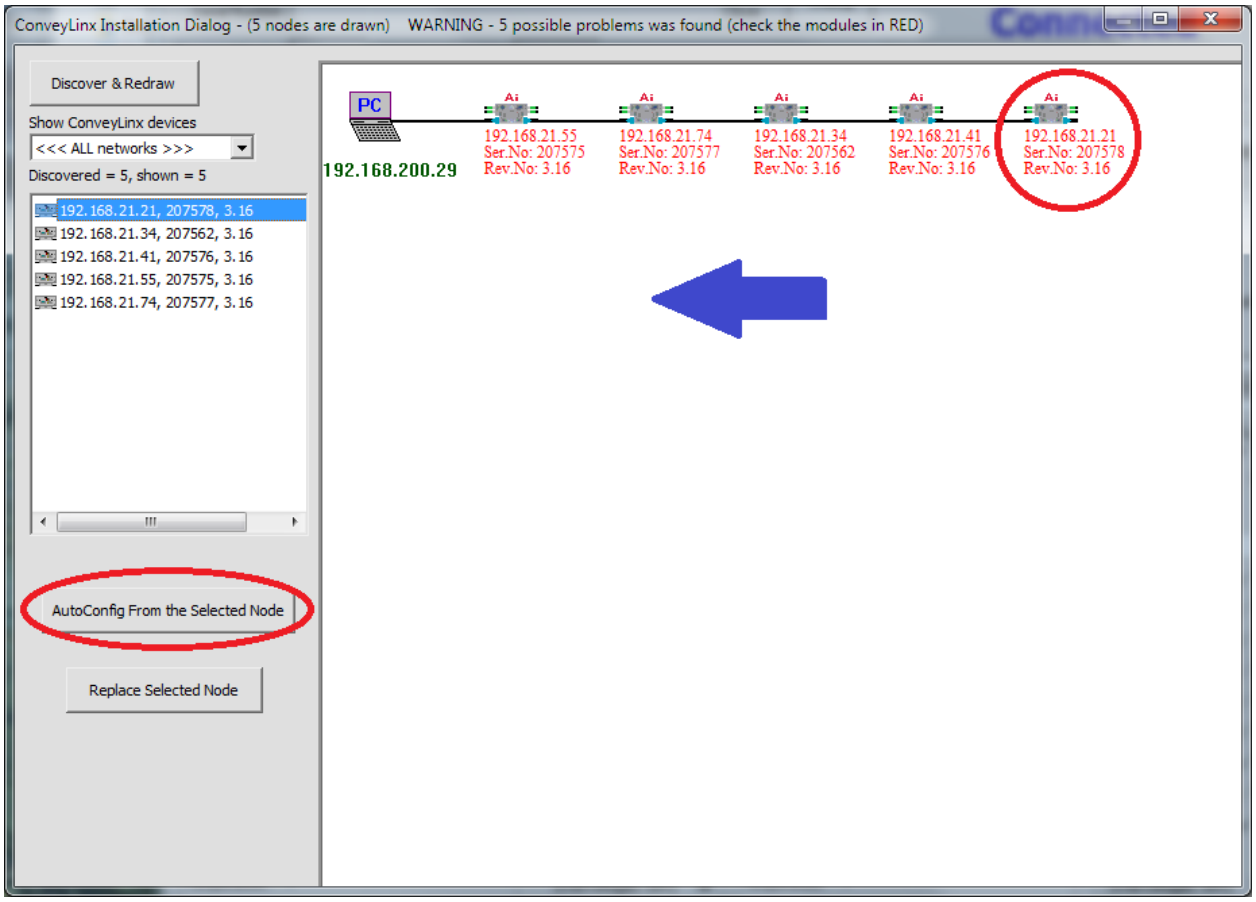


FIGURE 27 - AUTO-CONFIGURATION FROM THE FARTHEST NODE FROM THE PC

Auto Detection of Opposite Side Module Location

The cable connections between Left and Right Ethernet ports can be used in situations where the *ConveyLinx-Ai2* has to be mounted in the conveyor's opposite side frame. If properly connected, the Auto-Configure routine will detect this and configure the conveyor flow properly. Figure 28 shows an example of opposite side location detection.

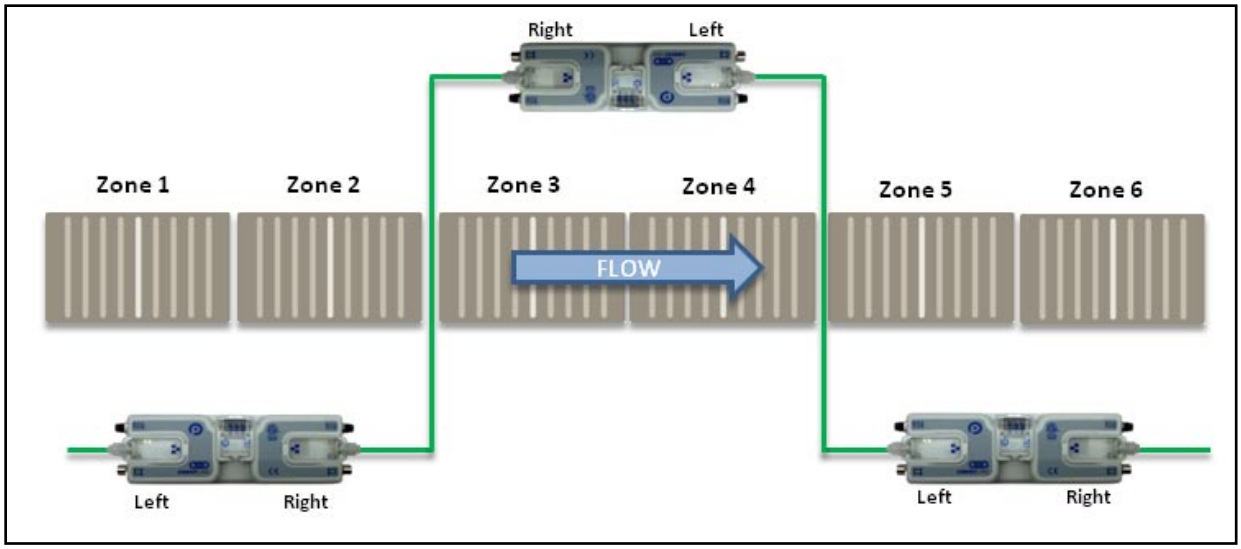


FIGURE 28 - OPPOSITE SIDE MODULE LOCATION EXAMPLE

Auto Configuration Results

Normal Results

When the auto-configuration routine is complete, each *ConveyLinx-Ai2* will automatically reboot. When a *ConveyLinx-Ai2* has been successfully configured and rebooted, its *Module Status* LED will blink on and off green.

Please note that the time to complete the Auto-Configuration procedure is dependent on the number of modules being configured. Larger networks will take more time than smaller networks.

The topology view will show the module detail information in black text (no longer red) when the auto configuration is complete and successful as shown in Figure 29.

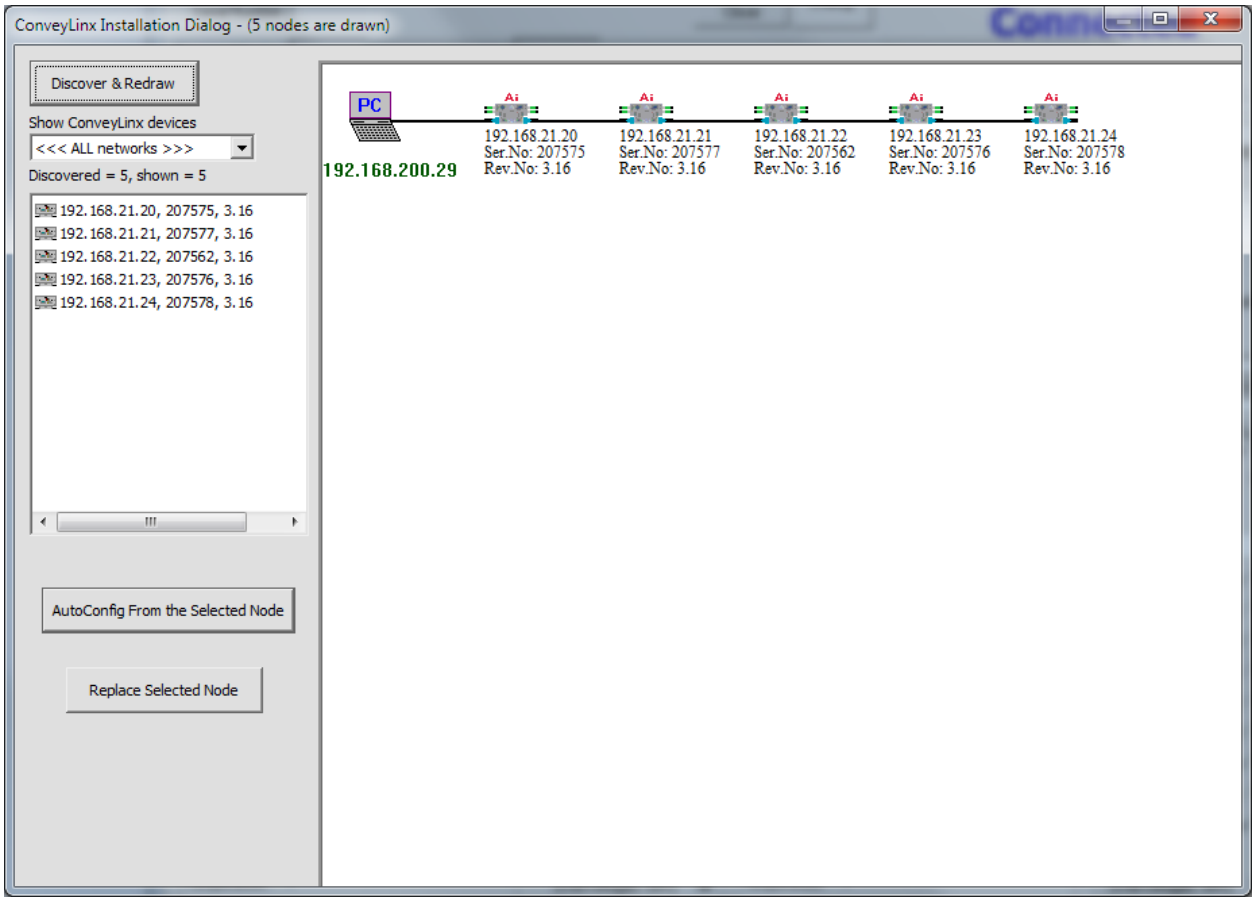


FIGURE 29 - AUTO-CONFIGURATION SUCCESS

If all *Module Status* LED's are blinking green; then to fully verify configuration is to place a single load onto the most upstream zone and see that it conveys to the discharge zone. If it does, then the Auto-Configuration is successful. If it does not, then see section *Trouble-Shooting Failed Auto-Configuration* below.

Please note that once a network has been configured; attempting to again Auto-Configure any *ConveyLinx Ai2* that is not the *Auto Configuration Master* will not initiate a new Auto Configuration procedure. The *ConveyLinx Ai2* will detect that it is not the most upstream unit and abort the procedure. However the *ConveyLinx Ai2* will perform its local re-booting procedure. This procedure will take a few seconds to complete

TROUBLE-SHOOTING FAILED AUTO-CONFIGURATION

The following chart lists some typical failed condition indicators and actions to take for resolution.

Failed Condition	Action
Status LED's OK with Unexpected Result	• Check that all photo-sensors are operational and that all zones are clear and perform procedure again. • Check all networks, MDR, Sensor, and power connections and perform procedure again. • Verify that all connections are valid. Refer to section • Invalid Configuration Examples on page 29. Correct connections and perform procedure again.
Status LED blinking or solid red on one or more modules	• Verify that there are no Ethernet Switches or PC's connected between *ConveyLinx-Ai2* modules. The Auto Configuration procedure will abort if a non-*ConveyLinx* device is detected along the path before reaching the last node. Modules up to that point will be configured, but the remaining modules will not. • When removing a *ConveyLinx-Ai2* from an existing network that is already operational; be sure to wait at least 2 minutes to allow the Ethernet switches on the remaining modules to reset before attempting a new Auto Configuration procedure.

DEFAULT SINGULATION RELEASE ZPA MODE

Loads will normally convey from upstream zone to downstream zone in singulation release fashion. A load reaching last zone photo-sensor will cause last zone motor to continue to run to discharge load to next conveyor or position.

In *Singulation Release Mode*, each zone waits until the zone in front of it is clear before it is allowed to run. This mode assures at least a zone-length of gap between loads as they are being conveyed. When the first load needs to stop and cause all those behind it to accumulate; the trailing loads stop in their respective zones when their leading edge blocks the zone's photo-sensor. Figure 30 shows a typical example of singulation release.

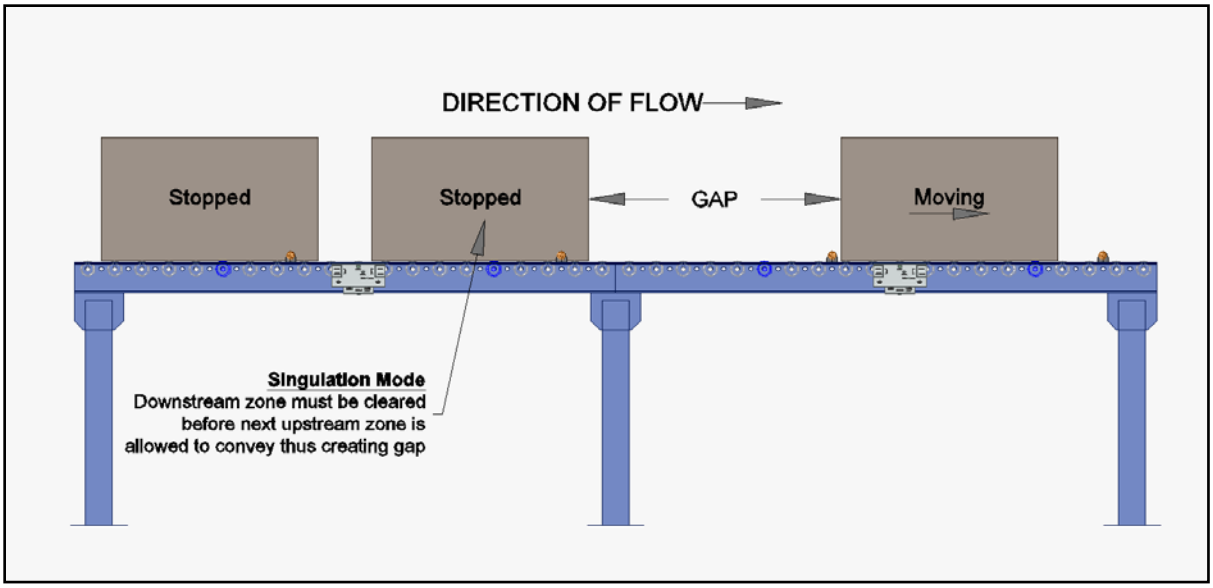


FIGURE 30 - SINGULATION RELEASE EXAMPLE

DEFAULT FLEX ZONE RECOGNITION FEATURE

ConveyLinx-Ai2 modules will automatically detect that a given carton is longer than one zone length and automatically adjust accumulation control so that the longer carton occupies two logical zones and will keep the next upstream carton from conveying into the longer carton. Flex Zone mode operates for both singulation and train release modes.

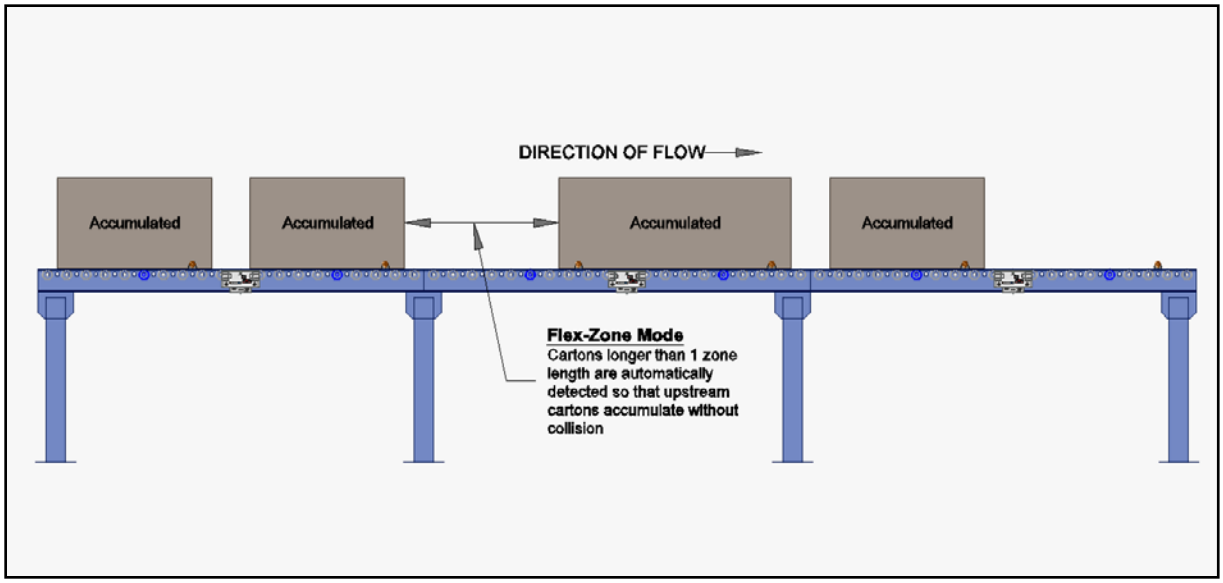


FIGURE 31 - TYPICAL FLEX ZONE MODE EXAMPLE

Please note that Flex Zone mode operates for carton lengths up to 2 zone lengths only. Operating conveyor system with cartons whose lengths are in excess of 2 zone lengths will produce undesirable results such as excessive detected jam conditions and faults.

Flex Zone functionality is only applicable for Singulation Release mode. Flex Zone may not operate properly when using Train or Gap Train release modes.

Please refer to the integrated help inside *EasyRoll* for definitions and usage of the other available ZPA modes.

JAM CONDITIONS

There are two (2) types of Jam conditions detected by the *ConveyLinx-Ai2*:

- Sensor Jam
- No Arrival Jam

SENSOR JAM

If a load remains blocking the photo-sensor in an upstream zone after an attempt to move the load to its next downstream zone, the *ConveyLinx-Ai2* will detect a Sensor Jam. This will be indicated as shown on chart in section *Sensors* on page 32. In this case, if the load is cleared from the photo-sensor, the *ConveyLinx-Ai2* will automatically clear the Sensor Jam condition after the default 5 second Reset Timer expires.

After the Sensor Jam occurs and the sensor remains blocked; the *ConveyLinx-Ai2* will attempt to self-clear the Sensor Jam condition. First, the *ConveyLinx-Ai2* will run the affected zone's motor in reverse for up to 1 second in order to clear the blocked sensor. If the sensor is still blocked after this first reversing attempt, it will repeat this motion 2 more times. If the sensor becomes clear after any of these three attempts, the zone will return to normal function and the *ConveyLinx-Ai2* will attempt to convey the load downstream under normal ZPA control.

If the sensor remains blocked after three attempts of this motor reversing cycle; the zone will remain in Sensor Jam state and the load must be removed manually to reset the zone.

NO ARRIVAL JAM

When a load leaves an upstream zone and is conveyed to its next downstream zone, this upstream zone expects positive confirmation of load arrival from the downstream zone. This communication occurs automatically along the ConveyLinx network. If a new load arrives at this upstream zone while this upstream zone is waiting for a downstream arrival confirmation, the new load will accumulate on this upstream zone. If the upstream zone does not receive this confirmation within the Jam Timer interval, the *ConveyLinx-Ai2* will produce a No Arrival Jam fault. Once a No Arrival Jam occurs, the *ConveyLinx-Ai2* will automatically hold any new load at the upstream zone for a pre-determined Reset Timer value and then resume normal ZPA function. By default, the Jam Timer and the Reset Timer values are equal so that the maximum time a new load would remain accumulated in the upstream zone is 5 sec + 5 sec = 10 seconds.

The 5 second jam timer value is the default setting. Please refer to the integrated help inside *EasyRoll* for instructions on changing this value.

NETWORK FAULT

In instances where Ethernet network connection is interrupted between *ConveyLinx-Ai2* modules while in operation, loads will continue to convey and accumulate to the farthest downstream zone prior to where the network is interrupted. This farthest downstream zone will automatically accumulate the load and not allow it to convey further downstream. Once network communications are re-established, the zone will return to normal operation.

LOW VOLTAGE FAULT

In instances when the *ConveyLinx-Ai2* module detects that its supply voltage has dipped below 18VDC; the *ConveyLinx-Ai2* will place its configured zone or zones into accumulation mode. The *ConveyLinx-Ai2* will keep this state until it has detected that its input voltage has risen to at least 21VDC.

Persistent unexplained momentary stopping or hesitations in normal zone to zone load movement may be an indication of low voltage conditions. If this behaviour is consistently observed; please verify voltage at farthest point from power supply and review power supply sizing and wiring practices to insure proper voltage at all modules.

There are many diagnostic functions in *EasyRoll*. With their help you can determine how many times power supply has gone under 18V. This option can help you to find electrical problems in your installation.

AUTOMATIC MODULE REPLACEMENT

Once a linear conveyor has been commissioned by Auto-Configuration, the *ConveyLinx-Ai2* modules store configuration data about its upstream and downstream neighboring modules. This configuration data is automatically updated even if the linear conveyor has had its parameters modified by the *EasyRoll* software. The *ConveyLinx-Ai2* firmware uses this feature to allow for easy module replacement so that the entire linear conveyor does not have to be re-configured in order to replace a single module.

Automatic Module Replacement procedure will work to replace a ConveyLinx Ai2 on systems with multiple subnets. You do not have to temporarily disconnect any network connections or otherwise isolate the particular subnet where the replacement procedure needs to occur.

CONVEYLINX-AI2 MODULE REPLACEMENT PROCEDURE USING EASYROLL

1. Disconnect existing module's motor(s), network, photo-sensor(s), hardware, and power connections. The order of disconnection does not matter.
2. Connect new module's motor(s), sensor(s), hardware, network connections and power connections.
3. Start *EasyRoll V4.05* or higher. Press F2 and go to tab **Network Service**, click on **Discover** button. All modules in the network should be display. Click on **ConveyLinx Tree** button as shown in Figure 32 . Topology of the ConveyLinx modules will be display in a few seconds. Select the *ConveyLinx Ai2* module from the list on the left side and click on **Replace Selected Node** as shown in Figure 33. Note that this module's text detail in the topology view will be in RED.
4. Wait until *ConveyLinx Ai2* performs its internal boot-up procedures which will be indicated when the Module Status LED blinks on and off green.

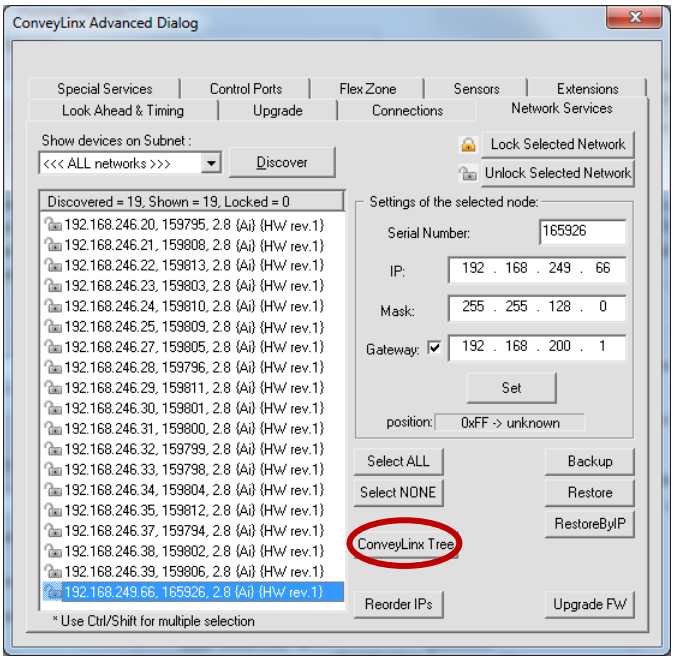


FIGURE 32 - EASYROLL NETWORK SERVICES TAB AFTER DISCOVERY

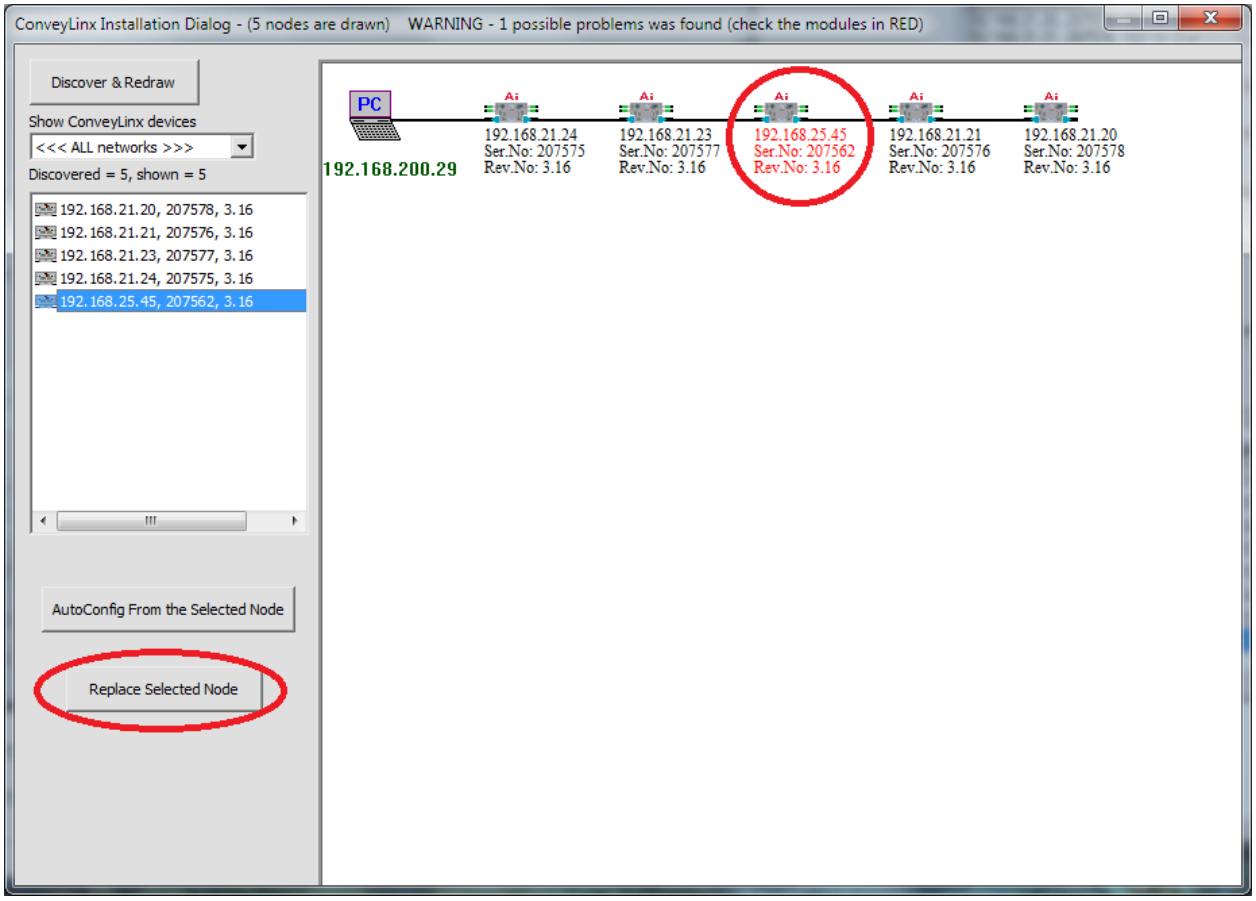


FIGURE 33 - TOPOLOGY VIEW AND REPLACING THE SELECTED NODE

You can also replace a module by selecting the module graphic directly in the topology view, right click to display the context menu, and select “Replace this Node” as shown in Figure 34.

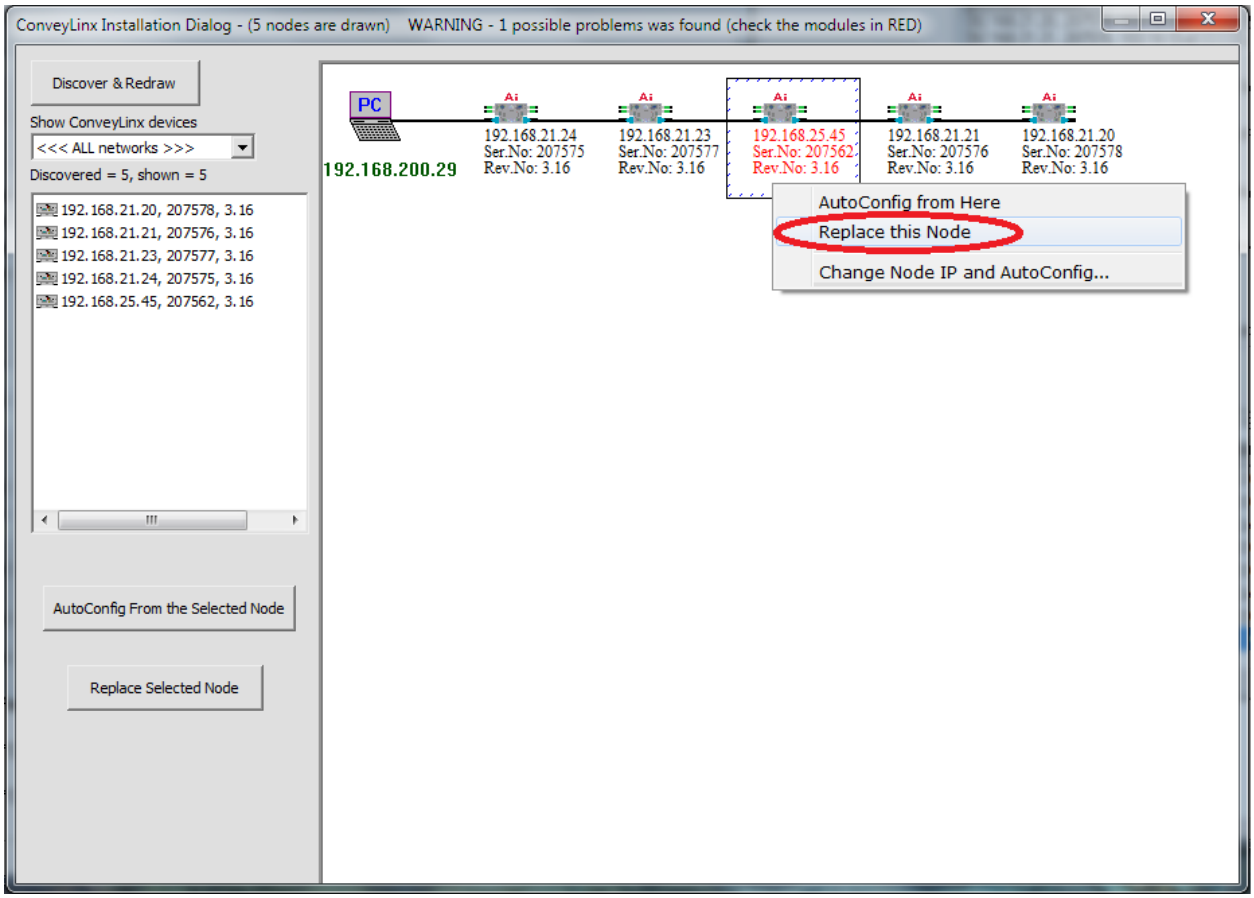
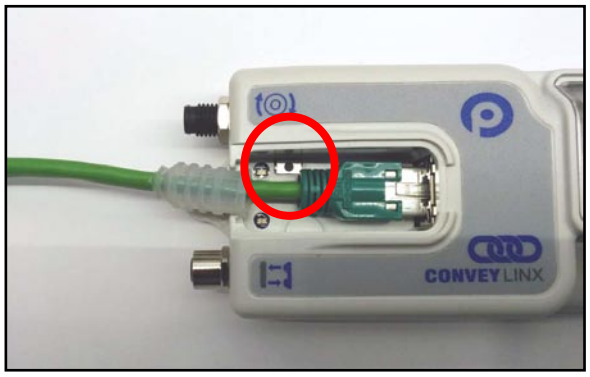


FIGURE 34 - MODULE REPLACEMENT FROM TOPOLOGY VIEW

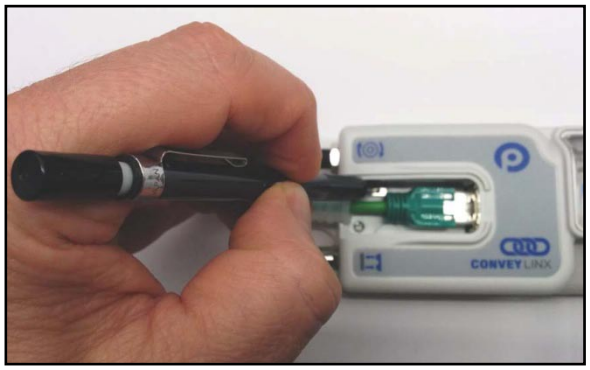
Module Replacement Using Replacement Button

You can replace a single ConveyLinx-Ai2 module without using *EasyRoll* by utilizing the Replacement Button located inside the Left Ethernet cable connection compartment. Simply install the replacement module and connect all sensors, motors, network cables, and power connections. The procedure is illustrated below.

The Module Replacement Button is located in the Left Ethernet cable compartment. Remove the compartment cover to gain access to the button



With a pointed instrument (pencil or small screwdriver) press and hold the button for 2 seconds until the Status LED flashes red and then release the button.



Please note that the Module Replacement Procedure (either with EasyRoll or Replacement Button) can take a few minutes to complete. The replaced module will restart itself a minimum of 4 times during the procedure. It will restart 5 times if firmware is being upgraded or downgraded.

EASYROLL SOFTWARE CONFIGURATION TOOL

INTRODUCTION

The *EasyRoll* Software Configuration Tool is a PC based application that provides the means to configure a *ConveyLinx* controlled conveyor system. *EasyRoll* also provides the ability to change *ConveyLinx* module default parameters.

Installing EasyRoll and performing the initial Auto Configuration is described in the previous section

BASIC FEATURES

Some of the basic module parameters that can be modified by *EasyRoll* are:

- ZPA Mode Selection (singulation, train, etc.)
- MDR type (ECO or BOOST)
- MDR rotation direction
- MDR speed, acceleration and deceleration values
- Jam and Run After clear time values
- *Look Ahead* slow down and *Lane Full Interface* settings
- *Blink &Wink* function used to visually locate an *ConveyLinx-Ai2* on the conveyor

EasyRoll provides the ability change these parameters for a single module or a group of modules all at once.
EasyRoll has the ability to display the status information for any *ConveyLinx* module on the network's subnet.

ADVANCED FEATURES

Some of the advanced features available with *EasyRoll* are:

- Firmware Upgrade utility for one or a group of *ConveyLinx-Ai2's.*
- *Network Services Discover* utility used to find all *ConveyLinx-Ai2's* on a network and manually set their I.P. addresses.
- Module *Connection* mapping to logically link two or more separate *ConveyLinx* networks.
- *Extensions* to allow a *ConveyLinx-Ai2* to suspend its ZPA function and be logically connected to an adjacent *ConveyLinx-Ai2* for motor run command.
- *PLC* mode selection allows a *ConveyLinx-Ai2* to suspend its *ZPA* function and be logically controlled from an external PLC.
- The ability to Back-Up and Restore the Network Configuration.
- The ability to restore a backup by IP or by Nodes. Restoring by IP's is useful when you need to duplicate part or all of a system.

OPTIONS FOR CONFIGURING YOUR PC'S IP ADDRESS

Note that your PC's I.P. address does not have to be in the same subnet as your ConveyLinx-Ai2 modules in order to perform the Auto Configuration procedure with EasyRoll as described in the previous section. However, your PC's I.P. address and/or subnet mask has to be properly set in order to read and change ConveyLinx-Ai2 module's parameters and settings.

Once a *ConveyLinx* network or *Subnet* has been configured by the *Auto-Configuration Procedure* with the *Subnet* value taken from the factory "out of the box" IP address of the *Auto Configuration Master* (similar to example shown above); you will need to do **one** of the **three** following procedure in order to have your PC be able to connect to the *Subnet* and use *EasyRoll* software:

Option	Description
Method 1	Allow *ConveyLinx's* built-in *DHCP* service automatically assign an I.P. address to your PC
Method 2	Manually change the I.P. address and/or subnet mask of your PC to match the *ConveyLinx Subnet*
Method 3	Manually change the I.P. address of the *Auto-Configuration Master* to a new *Subnet* that is accessible from the I.P. address already configured in your PC

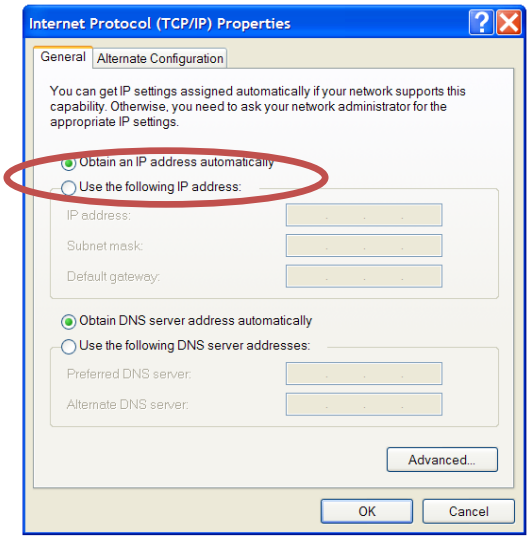
Any of these choices is equally valid and totally dependent on user preference.

METHOD 1 - USING DHCP SERVICE FOR PC I.P. ADDRESS

For installations where you are connecting to a single simple *Subnet* and your PC is already configured to have its I.P. address assigned; it is recommended to allow the *ConveyLinx* network automatically assign an I.P. address to your PC utilizing *ConveyLinx's* built-in *DHCP* service. This is the easiest method particularly if your PC is already set-up to have its I.P. addressed assigned.

If using the ConveyLinx *DHCP* service to assign your PC's I.P. address; you do not need to even start *EasyRoll* to accomplish this.

If your PC is already configured to obtain an IP address automatically; then by simply connecting you PC as shown in *Figure 23 - Initial PC Connection to ConveyLinx Subnet* is all you have to do to have the PC's I.P. address configured so you can use *EasyRoll*



Manual I.P. Address Configuration Methods

Manual configuration of your PC's I.P. address may be your preference for larger system configurations with multiple *Subnets* and/or installations where you want to keep a dedicated PC connected all the time.

For installations where there are multiple *ConveyLinx Subnets* that share the same physical Ethernet cabling (either directly or through Ethernet switches); it is recommended that the *Subnets* be pre-determined and that each *Auto-Configuration Master* have its *Subnet* set in advance of performing each of their respective Auto Configuration Procedures. By pre-determining all *Subnets* required; your PC can have its I.P. address and subnet mask set to appropriate values so that you can access all of your *ConveyLinxSubnets* from a single PC with *EasyRoll*.

Regardless of which manual procedure you choose, with your PC and *EasyRoll* you can easily accomplish either.

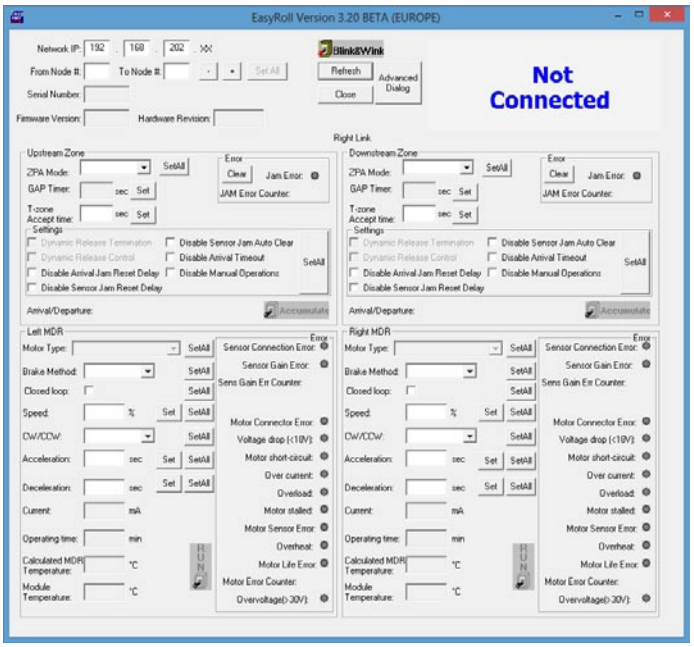
Using EasyRoll to Locate Auto-Configuration Master

For either manual method of I.P. address configuration, you must access the I.P. address information of the *Auto-Configuration Master ConveyLinx-Ai2* on your network by using *EasyRoll*.

Starting EasyRoll Application

If you followed the default installation setting when you installed *EasyRoll*; the program should be selected from "Start – All Programs – Industrial Software – EasyRoll". If you selected a different location when you installed; go to that location and run "EasyRoll.exe".

When you first run *EasyRoll*; you should see a window similar to this with greyed out status values and blank parameter boxes



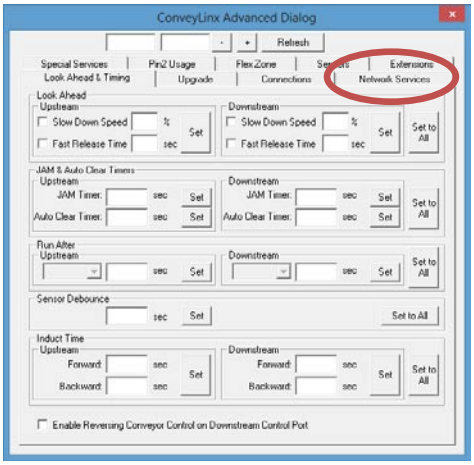
Regardless of whether you need to change your PC's I.P. address to match your already configured *ConveyLinx Subnet* or change the *ConveyLinx Subnet's Auto-Configuration Master* to match a subnet address you want to use; you have to connect to the *Auto-Configuration Master*.

USING THE NETWORK SERVICES UTILITY

One of the features of *EasyRoll* is that it has a utility called *Network Services Discover* that allows your PC to go and find any *ConveyLinx-Ai2* modules that may be physically connected to you network regardless of the I.P. address settings of your PC or the I.P. address settings of the *ConveyLinx-Ai2* modules.

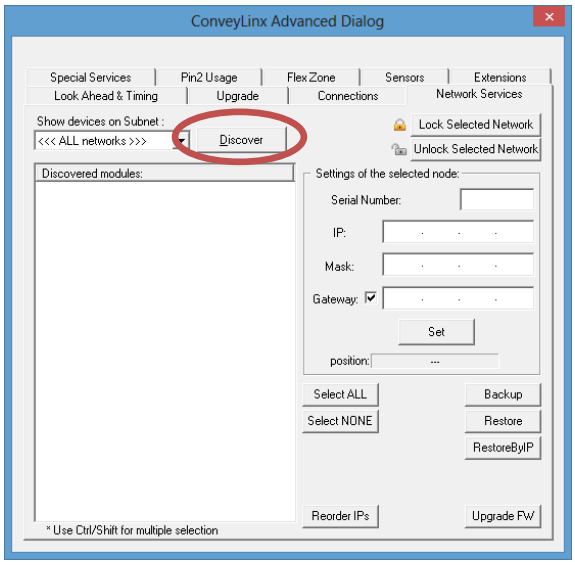
To access the UDP Discover Utility; you need to invoke the *ConveyLinx Advanced Dialog* window. To do this, press **F2.**

After pressing F2, *EasyRoll* will display the *ConveyLinx Advanced Dialog* screen. Click on the tab *Network Services.*



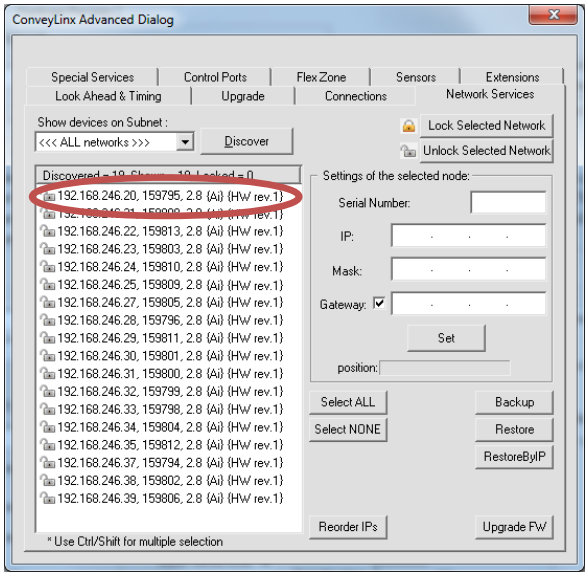
After clicking the *Network Services* tab, you will see the screen you will use to both "discover" the *ConveyLinx-Ai2's* that can be found as well as select a specific *ConveyLinx-Ai2* in which to modify its I.P. address settings.

On this screen, click the "Discover" button



After clicking the "Discover" button, *EasyRoll* will query the network and return a list of all *ConveyLinx-Ai2* modules it finds and shows each module's I.P. address, serial number and current Firmware. We already know that the *Auto-Configuration Master* is the *ConveyLinx-Ai2* with the *Node* of 20.

In this example, 19 *ConveyLinx-Ai2's* were found and the *Auto-Configuration Master* is at 192.168.246.20, its serial number is 159795 and has Firmware 2.8



Please refer to section *ConveyLinx Advanced Dialog* on page 72 for further descriptions for the remaining *ConveyLinx Advanced Dialog* screen selection tabs.

METHOD 2 - CHANGE PC TO MATCH AUTO-CONFIG MASTER

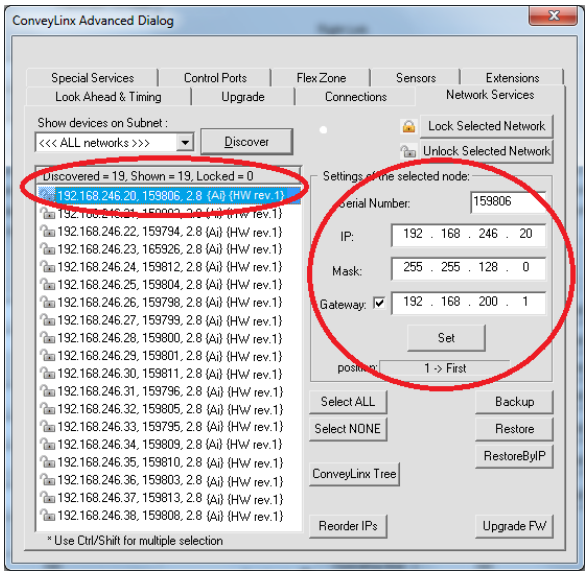
At this point, because you now know the *Auto-Configuration Master*'s I.P. address you can simply change your PC's IP address configuration so that is can have access to the *Auto-Configuration Master's Subnet*. In the example above, the *Auto-Configuration Master's* I.P. address is 192.168.26.20 therefore the *ConveyLinx Subnet* is

192.168.26. Please refer to *Appendix C–Configuring PC for Ethernet Subnets* for details on how to set your PC's IP address and subnet mask to access the *ConveyLinx Subnet* you discovered.

METHOD 3 - CHANGE AUTO-CONFIG MASTER I.P. ADDRESS

In cases where you want to set the *Auto-Configuration Master's* I.P. address to something other than the default it used when the *Auto Configuration Procedure* was performed, you can do this from the same *Network Services* screen.

Double click the *Auto-Configuration Master* in the list. When you do this, its I.P. address information is filled in as shown. Simply enter in the new I.P. address information you want to use and then click the "Set" button.



After clicking the "Set" button, you can click the "Discovering" button again and *EasyRoll* will refresh the list of modules at the left. You can verify that the module has the new I.P. address settings.

At this point, this particular *ConveyLinx Subnet* will no longer operate because its *Auto Configuration Master's* I.P. address has been changed. You must perform the *Auto Configuration Procedure* again so that all downstream *ConveyLinx-Ai2's* will have their I.P. address updated to match the *Auto Configuration Master's* new *Subnet.*

EASYROLL MAIN SCREEN

Assuming you have either changed your PC's configuration or changed the *Auto Configuration Master's* configuration as described above; you should now be able to use the *EasyRoll* main screen to view your system's status and change operational parameters. If you have followed the above example, simply closing the *ConveyLinx* Advanced Dialog will show the main screen. The main screen is also shown when you first run *EasyRoll*. *Figure 35 - EasyRoll Main Screen* shows a typical main screen.

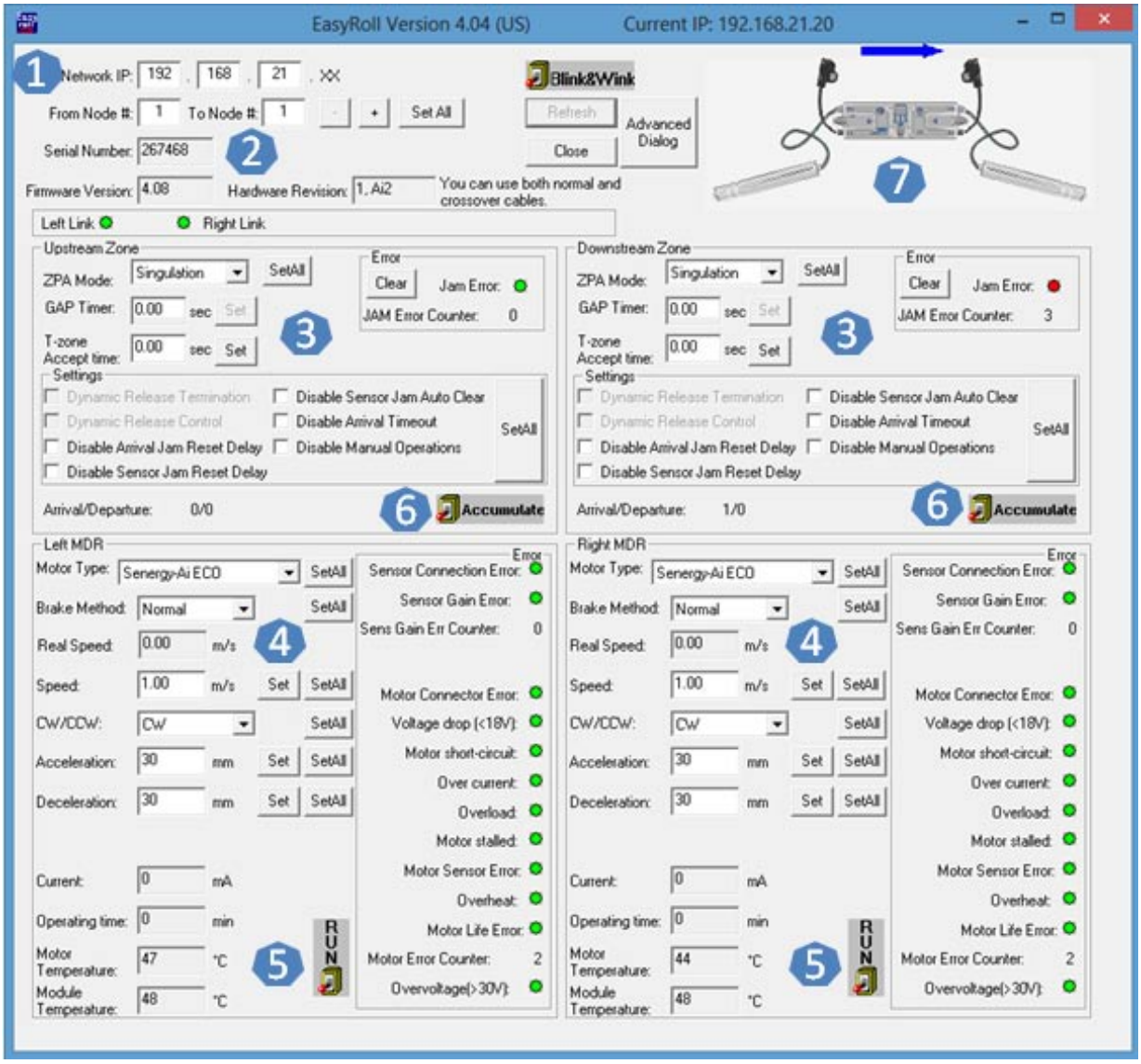


FIGURE 35 - EASYROLL MAIN SCREEN

The numbered items in *Figure 35 - EasyRoll Main Screen* show the basic functional areas and detailed descriptions will follow for each.

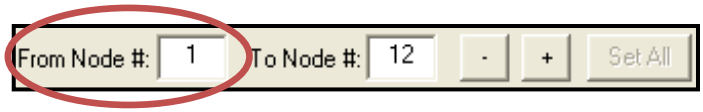
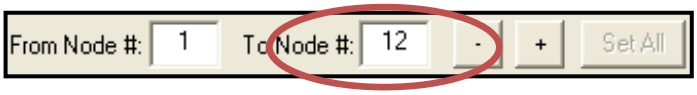
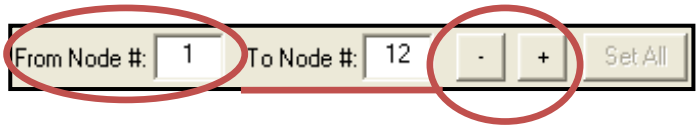
Item	Description
1	Network IP – This is where you enter the *Subnet* of the particular *ConveyLinx* network you wish to connect
2	Node No. – This is where you enter a range of *Nodes* in which to connect. Entering values here will cause the "Refresh" button to enable. Clicking this button will cause the rest of the items (3, 4, and 5) to be populated.
3	Upstream Zone / Downstream Zone – These selections allow you to change the ZPA mode of the particular zone as well as diagnostic controls to jog the zone ("Forced Run") and command the zone to Accumulate if a load arrives.
4	Left Zone / Right Zone Settings – These are the selections for changing MDR type, braking method, closed loop regulation, speed, direction, and accel/decel time values. There are also "Set" and "Set All" buttons used to write values to module(s)
5	Force Run – On/Off Toggle controls used to jog the local zone's motor
6	Force Accumulate –On/Off toggle controls used to set the local zone to accumulation mode
7	Configuration Indicator – This area will display a graphic image of the current module's detected configuration

Please note that some of the detailed information shown in this figure may be different for your particular system and that most of these fields will be blank until you actually initiate communications.

CONNECTING TO CONVEYLINX

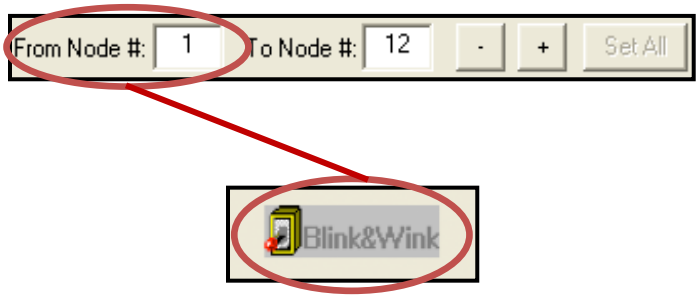
Once the Network IP boxes (1) have been entered with the correct *Subnet*, you then type in a range of *Nodes* (2) you wish to connect; the "Refresh" button will become enabled. Click the "Refresh" button and data for the rest of the main screen should fill in.

NODE NAVIGATION

Whatever *Node* is entered in the first box will be the particular *ConveyLinx-Ai2* data shown in the remainder of the main screen.	
The *Node* value entered in the second box does not have to be the actual "last" node of the network. If you enter a *Node* value higher that exists; an error message will display after you click the "Refresh" button. For the example shown; if there were only 10 *Nodes* installed and you entered 12, you would receive 2 error messages in succession after clicking the "Refresh" button.	
Clicking the "+" and "-" buttons will increment / decrement the *Node* value in the first box and display the *ConveyLinx-Ai2* data for the new *Node* selected. Please note that if you increment past the value of the last physical *Node* installed, you will receive an error message.	

NODE IDENTIFICATION

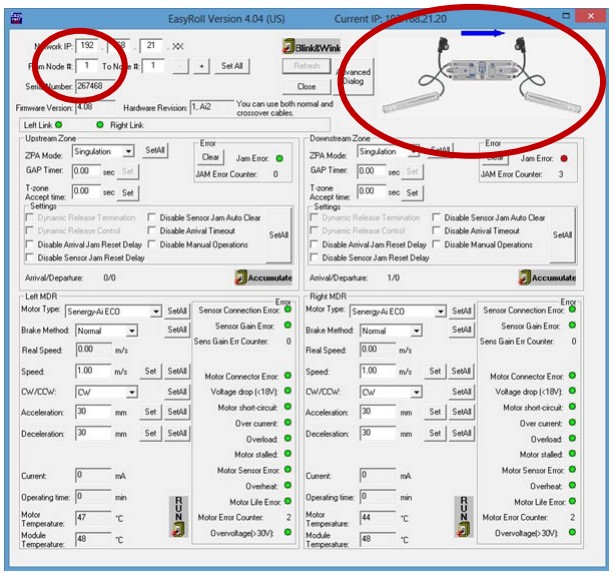
*EasyRoll*main screen has a feature identified as "Blink & Wink" that allows you to visually verify the *Node* you have selected.

If a valid *Node* is selected in the first text box in the "Node No." area and its information is displayed on the main screen; clicking the "Blink&Wink" switch will signal the selected *ConveyLinx-Ai2* to blink on and off all of its LED indicators. Click the "Blink&Wink" switch again to turn this off.	

Module Diagnostic Window

By clicking the image of the *ConveyLinx-Ai2* module in the upper right of the main screen will open the Module Diagnostic Window.

Click the image in the upper right to open the Module Diagnostic Window and display the current status of the selected node



When opened, the Module Diagnostic Window displays the current status of the selected connected module. This window shows the current status of the module as well as the zone status of this module's immediate upstream and downstream connections. You can also see the state of any connected sensors and motors. An example is shown in Figure 36.

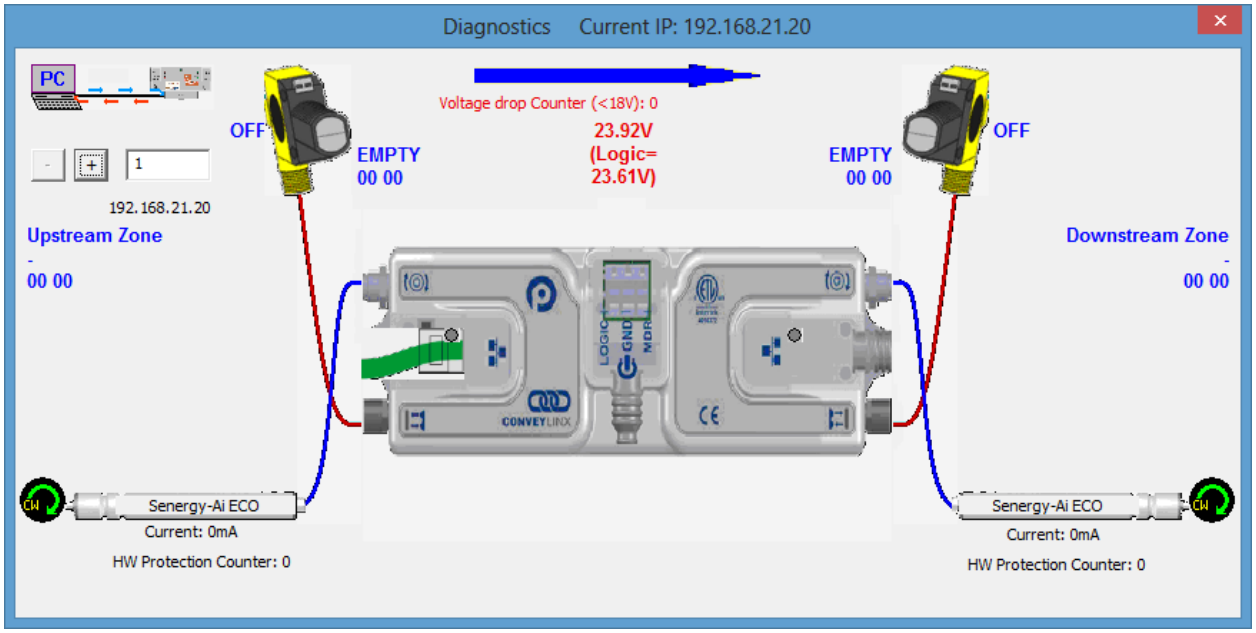


FIGURE 36 - MODULE DIAGNOSTIC WINDOW EXAMPLE

One very useful feature of the Module Diagnostic Window is that you can mouse-over the image of each roller and a pop-up will display the pertinent motor parameters as well as the part number and serial number of the connected roller as shown in Figure 37.

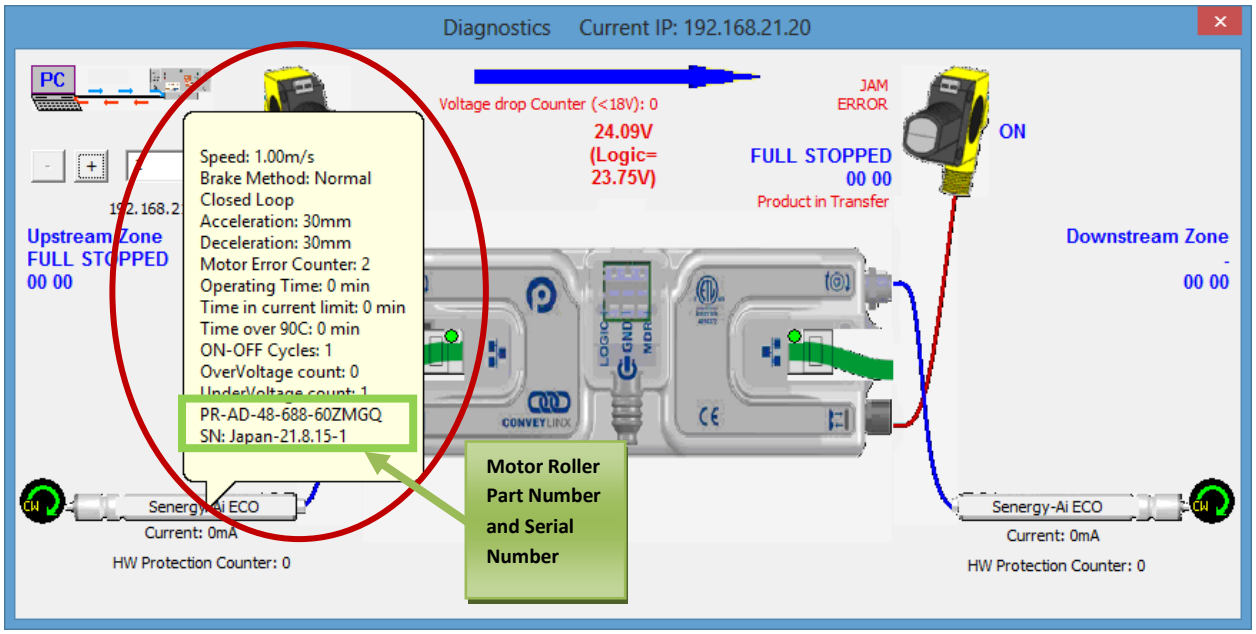


FIGURE 37 - MODULE DIAGNOSTIC SHOWING MOTOR ROLLER DATA

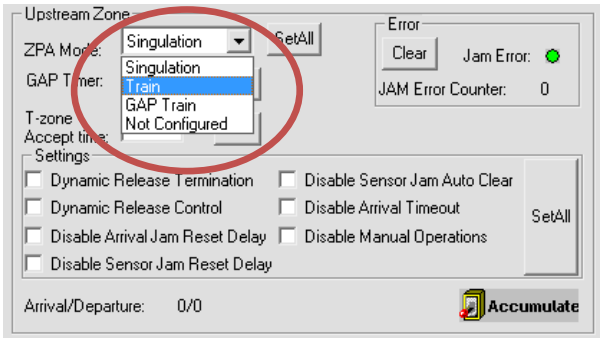
A powerful feature of the ConveyLinx-Ai module is that it retains the part number, serial number, and usage data for the last 32 motors that have been connected. This data is also preserved if a module is replaced as described in section Automatic Module Replacement on page 48.

UPSTREAM / DOWNSTREAM ZONE CONFIGURATION

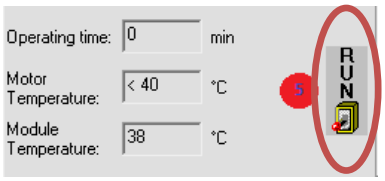
Once you have selected the particular *Node* you wish to view and/or modify, you can go to the particular settings.

Selecting the pull down box for "ZPA Mode" will show the available selections. *Singulation* is the default configuration. Please refer to section

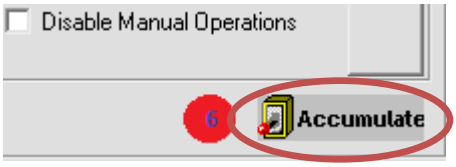
ZPA Mode Selections for descriptions for *Train* and *GAP Train* modes.



Clicking the "Run" switch will cause the zone's MDR to jog in its default rotation direction.

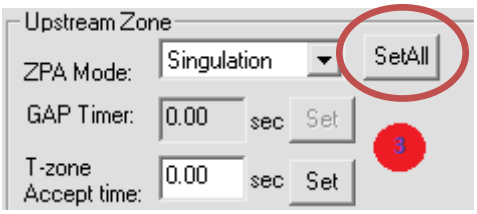


Clicking the "Accumulate" switch will place the zone in accumulation mode and the next load that arrives at that zone will stop and remain until you click the switch again to turn off the accumulation mode.



Selecting a new setting from the "ZPA Mode" drop down box immediately changes the zone's mode. If you want to set all Upstream zones for the range of nodes entered in the "Node No." text boxes, then click the "Set All" buttons.

Similarly, you can do the same operation in the "Downstream Zone" portion of the main screen.



ZPA Mode Selections

Singulation mode is the default configuration for all zones upon the completion of the *Auto Configuration Procedure*. Please refer to section *Default Singulation Release ZPA Mode* on page 44 for description. The following sections describe the ZPA modes available via *EasyRoll*.

Train Release Mode

For zones configured for *Train Release Mode*; when the downstream train zone releases, all subsequent upstream zones begin to run simultaneously. This makes the MDR conveyor operate similar to a conventional single drive roller conveyor in that all loads move at once. Figure 38 illustrates a typical Train Release example.

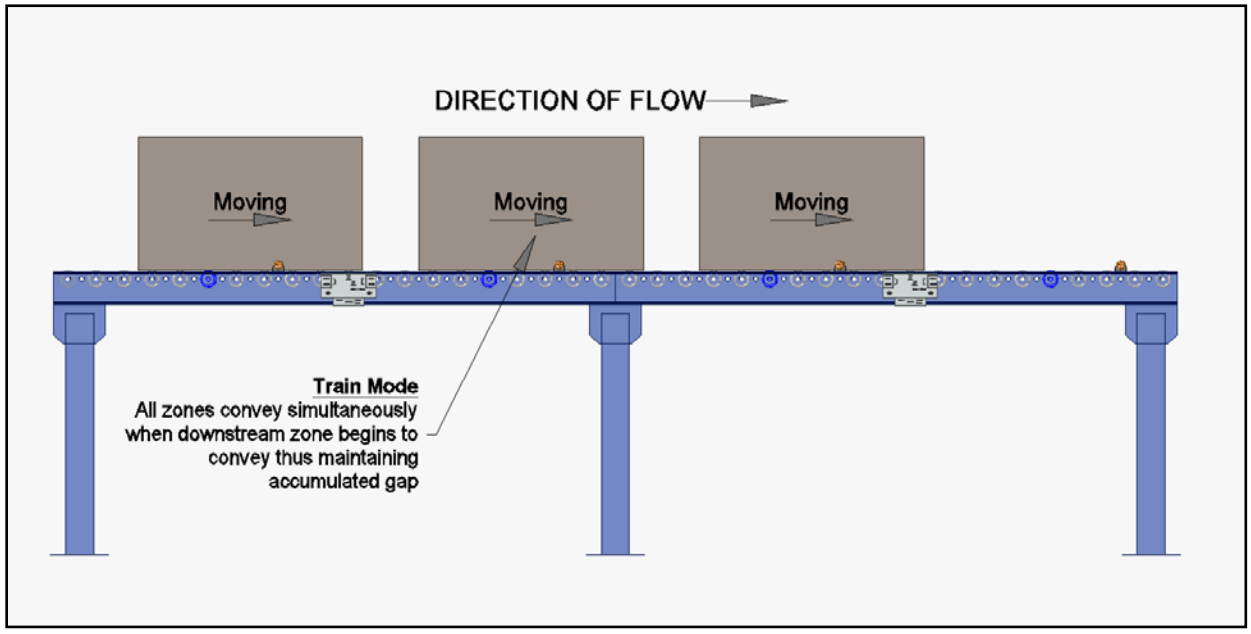


FIGURE 38 - TRAIN RELEASE EXAMPLE

Please note that singulation and train modes are configurable per zone and can be mixed on the same network.

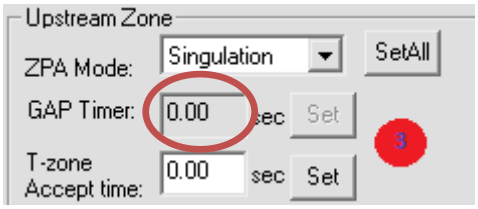
GAP Train Release Mode

Gap Train is a variant to *Train* release in that it incorporates a fixed time delay prior to allowing the loads to move. The typical usage of *Gap Train* would be to apply this configuration to the discharge zone of a group of zones already placed in *Train* mode. This configuration could be used to assure a specific minimum gap between cartons.

For example, let's say the Gap Timer is set to 5 seconds on the discharge zone and we have 10 zones behind this discharge zone all set to *Train Mode* and all zones are occupied and accumulated. We then release the carton in the discharge zone. All cartons in all 10 zones move simultaneously because they are in *Train* mode. Once the lead carton in the discharge zone has cleared its photo-sensor; the *Gap Timer* starts. The next carton arriving at the discharge zone will stop at the discharge zone and remain stopped until the *Gap Timer* expires. When the *Gap*

Timer expires; the discharge zone will release and the train of cartons in all 10 upstream zones will again move simultaneously forward.

When you select "Gap Train" from the "ZPA Mode" drop-down box; the "Gap Timer" data entry box and "Set" button are enabled. Simply enter the desired time value and click the "Set" button to update the value in the selected *Node*



Gap Train mode is designed to be used at the discharge zone of a group of zones configured for _Train_ mode. If more than one consecutive zone is configured as _Gap Train_; then each of these zones will in turn require that their respective gap timers expire. Depending on the time value used, the result will appear to be _Singulation_ mode.

T-BONE CONFIGURATION

In conveyor applications, transferring a load at a right angle from one conveyor to another often requires special lifting and lowering mechanisms. In certain applications, one conveyor can simply drive its load off of its downstream zone directly onto the upstream zone of another conveyor that is perpendicularly oriented. This type configuration is commonly defined as a *T-Bone* arrangement. *ConveyLinx* contains the logic to control a *T-Bone* arrangement without requiring any external control interface or programming. Figure 39 shows the kind of *T-Bone* arrangement that is available within *ConveyLinx* without any external control interface.

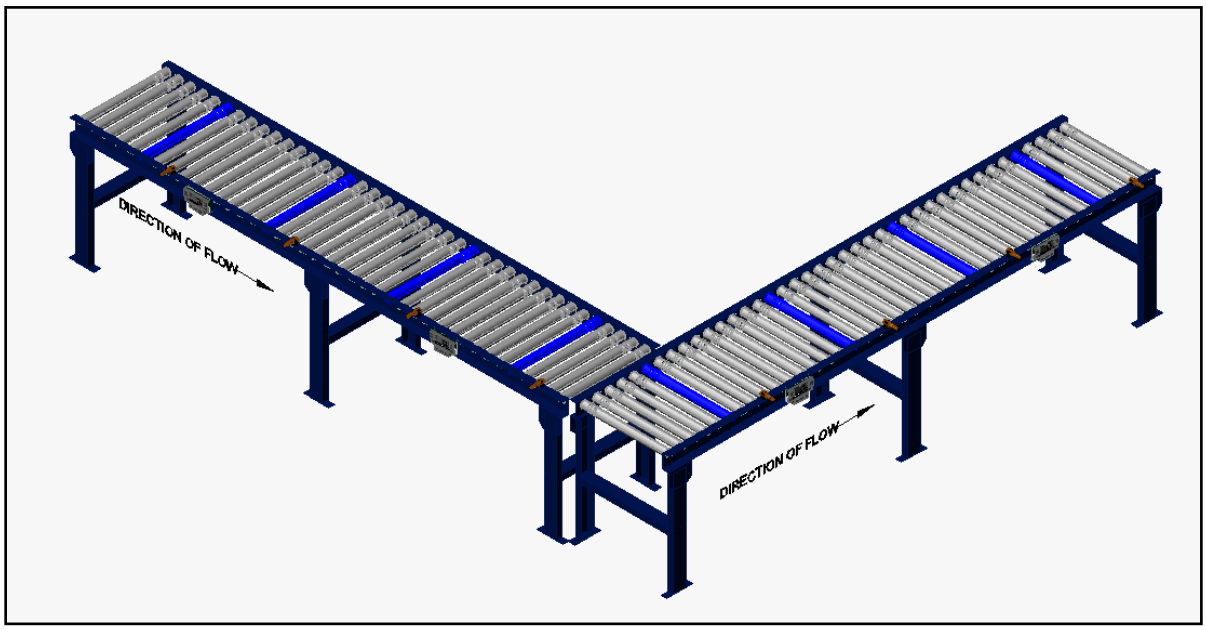


FIGURE 39 - TYPICAL T-ZONE CONFIGURATION

Material handling considerations such as discharge conveyor speed and load weight have to be analysed prior to implementing a *T-Bone* configuration. Be sure to verify your mechanical design and load characteristics before utilizing a *T-Bone* arrangement.

CONNECTING CONVEYLINX-AI2 *FOR T-BONE ARRANGEMENT*

A *T-Bone* arrangement can be made operational in one of two ways:

1. Sending and Accepting zones can be on the same *ConveyLinx-Ai2*
2. Sending and Accepting zones can be on separate *ConveyLinx-Ai2's.*

Figure 40 and Figure 41 depict two ways to connect the MDR's and photo-sensors to *ConveyLinx-Ai2* modules to result in a valid T-Bone configuration.

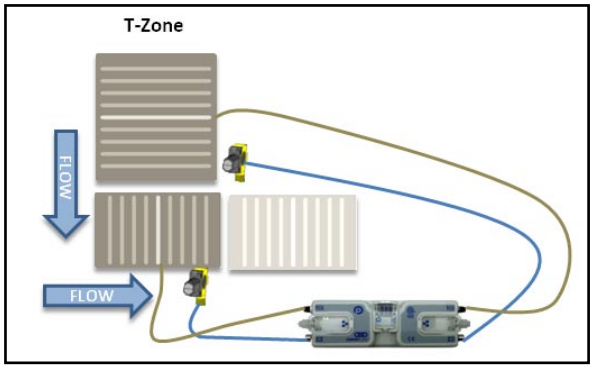


FIGURE 40 - SINGLE MODULE T-BONE EXAMPLE

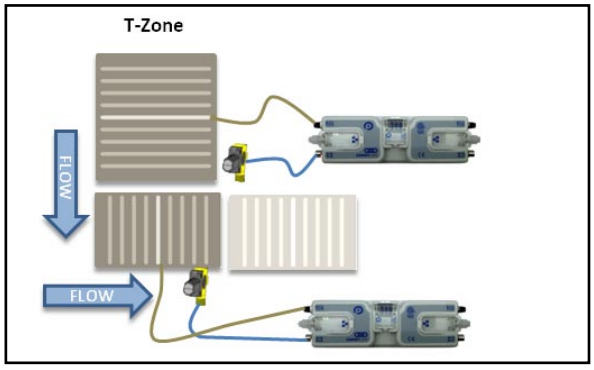
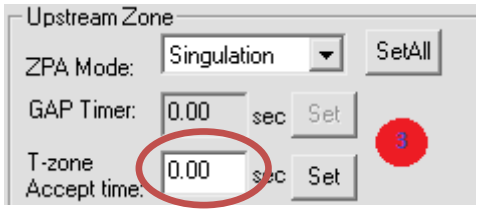


FIGURE 41 - TWO MODULE T-BONE EXAMPLE

To configure a T-Bone arrangement to operate properly, the "T-zone Accept Time" on the main screen must be set to a non-zero value. This time value is the duration that the accepting zone's rollers will delay in running so the upstream sending zone can convey the load onto stopped rollers in the accepting zone. Once this time value has expired, the accepting zone's rollers will be enabled to run based upon normal downstream conditions. A value of 200 milliseconds is typical for nominal MDR system speeds.

Enter the value, for example 0.200 for 200 milliseconds and click the "Set" button. Whether to change the *Upstream Zone* or *Downstream Zone* value on the main screen is dependent upon which zone is the *accepting* zone. The "T-zone accept time" is always applied to the *accepting* zone.

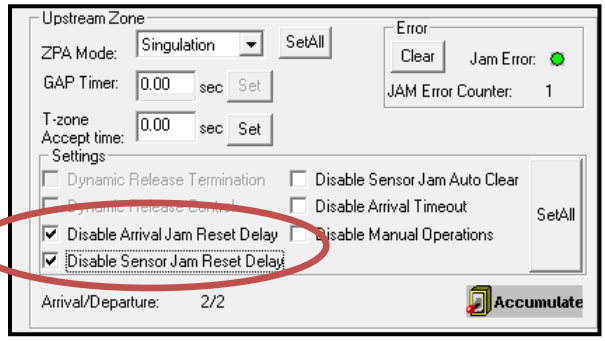


IGNORE JAM SETTINGS

Any individual zone or group of zones can be configured to ignore the auto reset time delay for either or both of the detected jam conditions. These jam conditions are described in section Jam Condition on page 46. Selecting either of these options will not eliminate the detection of the particular jam condition; it simply eliminates the default time delay the logic utilizes before automatically clearing the condition. For example, assume the Jam Timer setting is 5 seconds. If a particular zone sensor remains blocked while its zone is running for 5 seconds, the zone will stop and there will be a sensor jam condition. Under default configuration, the sensor must be cleared for 5 seconds (same value as Jam Timer setting) before the zone will return to automatic function. If the checkbox for "Ignore Sensor Jam" is selected, this delay of 5 seconds after the sensor is clear is not used and the zone will return to normal automatic operation immediately after the sensor is cleared.

Similarly for the Arrival Jam, if a load is in transit from upstream to downstream, the logic expects the load to arrive downstream within the time dictated by the Jam Timer setting. If it does not arrive within this time window, there is an Arrival Jam. After the Arrival Jam is detected, by default, it will automatically clear after the Jam Timer value of time has expired again. By selecting the checkbox for "Ignore Arrival Jam", the logic will not wait for the additional delay time and the Arrival Jam will automatically reset immediately after being detected.

Clicking either or both checkboxes will cause the zone's logic to ignore the reset delay for the particular jam condition.

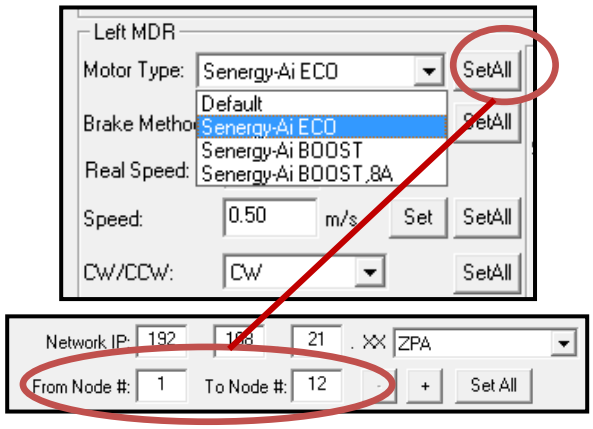


MDR Settings

The two largest areas of the main screen are for "Left Zone" and "Right Zone" and these areas display MDR settings and overall status as well as the ability to change motor settings.

Motor Type

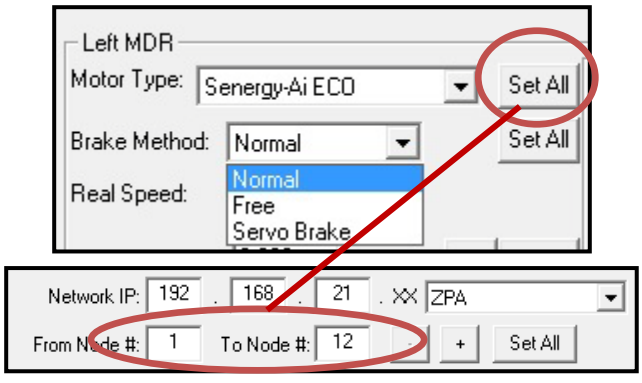
The "Motor Type" pull-down box lists all motor brand and types whose profiles are available for *ConveyLinx Ai2*. Senergy Boost is the default setting upon completion of the *Auto-Configuration Procedure*. The new settings are downloaded to the selected *Node* upon selecting a new item from the list. Clicking "Set All" will download the selected setting to the Left Zones of all *ConveyLinx Ai2's* entered in the range of *Nodes* at the top of the main screen in the "Node No:" boxes. If for example the "Node No." boxes had the values of 5 and 12; changing the selection in the "Motor Type" pull down will change *Node* 5 and clicking "Set All" will change *Nodes* 6 thru 12 to the same setting as *Node* 5.



Please consult your particular MDR's documentation and review your application if you are unsure as to which motor-type setting to use. Please also refer to *Appendix E – Power Supply Loading* on page 113 for additional information.

Brake Method

The "Brake Method" pull-down box lists all the MDR braking methods available for *ConveyLinx-Ai2*. *Normal* is the default setting upon completion of the *Auto-Configuration Procedure*. The new settings are downloaded to the selected *Node* upon selecting a new item from the list. Clicking "Set All" will download the selected setting to the Left Zones of all *ConveyLinx-Ai2's* entered in the range of *Nodes* at the top of the main screen in the "Node No:" boxes. If for example the "Node No." boxes had the values of 5 and 12; changing the selection in the "Brake Method" pull down will change *Node* 5 and clicking "Set All" will change *Nodes* 6 thru 12 to the same setting as *Node* 5.



The following table defines the MDR Braking Methods available:

Method	Description
Normal	Standard Dynamic braking - MDR power circuit in *ConveyLinx-Ai2* is internally connected during motor stop sequence to provide backward energy to bring rotor to a stop. When *ConveyLinx-Ai2* has detected that the motor has stopped; all winding current is shut off from the MDR. This is the MDR industry standard braking method and is the default factory setting for all *ConveyLinx-Ai2* zones from the *Auto-Configuration Procedure*
Free	MDR power circuit in *ConveyLinx-Ai2* is internally disconnected to allow rotor to "free spin" until its mechanical load brings it to a stop.
Servo Brake 1	When a zone is commanded to stop; the *ConveyLinx-Ai2* utilizes the MDR's Hall Effect sensors to determine the position of the rotor and will inject current into the motor windings to maintain rotor position.

Please note that for Servo Brake modes, the motor circuitry supplies power to the motor to keep it in position. The more torque required to hold the motor rotor position will result in more current being supplied. Prolonged braking at higher torque values can result in motor over current and/or over heating conditions.

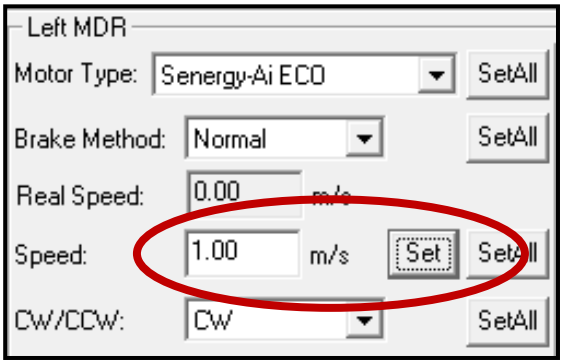
SPEED

The *Speed* setting value is in meters per second (m/s). The Senergy-Ai2 motor roller contains data as to its particular gear reduction ratio and roller diameter that is readable by the *ConveyLinx-Ai2* module. *EasyRoll* then uses this information to indicate whether the speed you enter is valid for the connected roller.

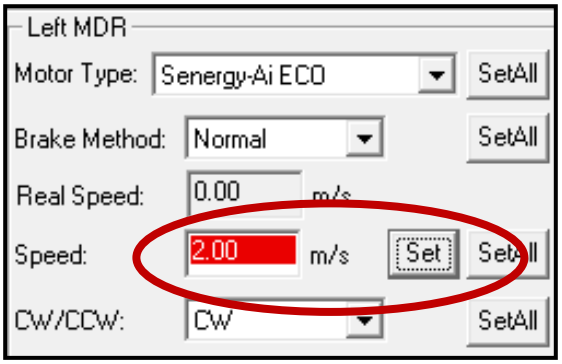
Motor Roller gear reduction can be determined from the motor roller part number which can be shown by mouse-over in the Module Diagnostic Window. Please visit pulseroller.com for more information on determining the rated speed and valid speed range for a given part number

For example, the motor roller information displayed in Figure 37 indicates that the rated speed of the motor roller we have connected to our module is 60 meters/minute, or 1 meter/second.

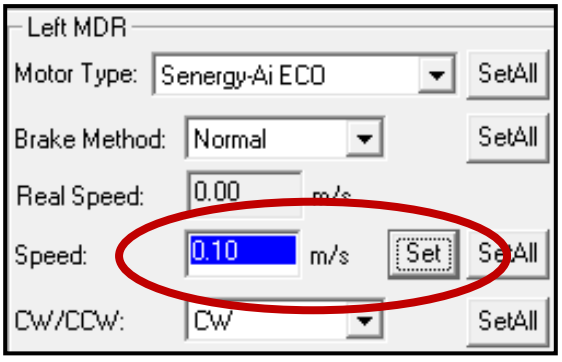
Entering a value of "1" for the speed and clicking "Set" will set the speed for the roller. If the background of the speed entry box remains white, then the speed is valid for the roller part number detected by the module.



For our example roller, entering a speed of 2 m/s is over its allowable maximum speed. The background of the speed entry box will change to red indicating the speed setting is too high



For our example roller, entering a speed of 0.1 m/s is under its allowable minimum speed. The background of the speed entry box will change to blue indicating the speed setting is too low



Motor Direction

This setting is either **C**lock-**W**ise (CW) or **C**ounter-**C**lock **W**ise and is determined for each *ConveyLinx-Ai2* based upon the *Auto-Configuration Procedure* results. Please refer to section *Motor Direction Definition* on page 30 for definition of rotation direction.

This setting is available because some mechanical designs or situations may cause the MDR to be mounted such that the MDR cable exits the opposite side of the conveyor from the *ConveyLinx-Ai2* module.

Please note that Motor Direction does not have a "Set All" button because motor direction is determined during the *Auto-Configuration Procedure*.

Acceleration / Deceleration

The acceleration and deceleration control for a given MDR is configurable in value of distance rotated. The default acceleration value is 30mm and the default deceleration time is 30mm.

The limit for acceleration values is 0.03 meters (30mm) to 10 meters. The limit for deceleration values is 0 to 10 meters.

ConveyLinx Advanced Dialog

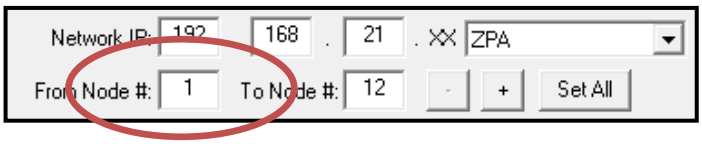
We introduced the *ConveyLinx Advanced Dialog* briefly in section *Using the Network Services Utility* on page 56. This section will define the remaining tab selections from this screen.

Invoking the ConveyLinx Advanced Dialog

To invoke the *ConveyLinx Advanced Dialog*, simply press the following keyboard keys:

F2 or **[Shift][Ctrl]U**

Whatever *Node* is entered in the first box when you press **[SHIFT][CTRL] U** or **F2** will be the particular *ConveyLinx-Ai2 Node* data in context for the *ConveyLinx Advanced Dialog* tab selections when the dialog screen pops up.



Look Ahead & Timing

The default screen tab of the *ConveyLinx Advanced Dialog* is the *Look Ahead & Timing* settings.

Look Ahead Feature

The *Look Ahead* feature configures the *ConveyLinx-Ai2* logic to "look ahead" to its next downstream zone and if it is occupied when a load is entering its zone, *ConveyLinx-Ai2* will dynamically adjust the MDR to the selected speed. This feature would be used in higher speed applications were increased stopping distance is required to keep loads from over-travelling their stop positions. This function can be applied per zone or system-wide.

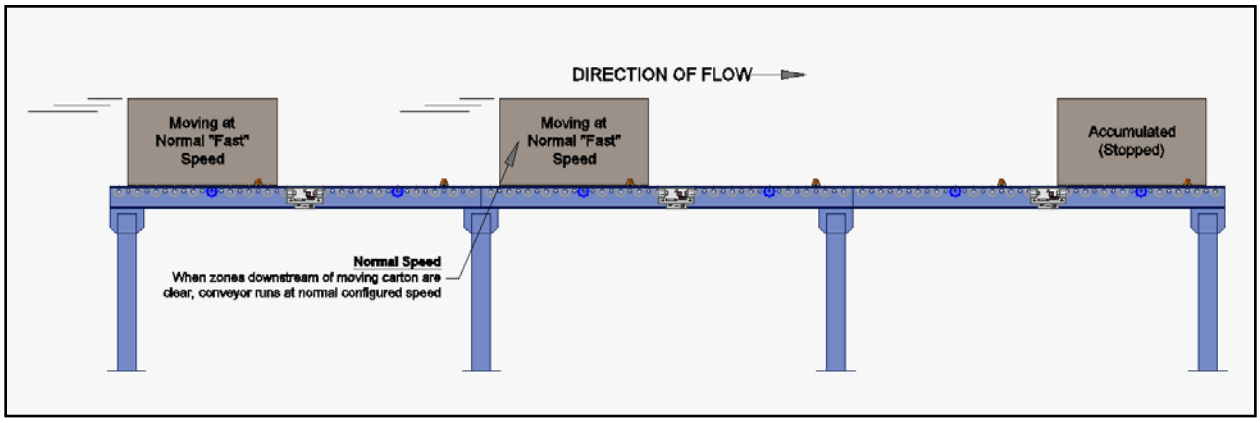


FIGURE 42 - NORMAL RUNNING BEFORE LOOK AHEAD ENABLES

In Figure 42, conveyor runs at the speed configured for *ConveyLinx-Ai2* per the *Auto-Configuration Procedure* or the value entered if it was manually changed.

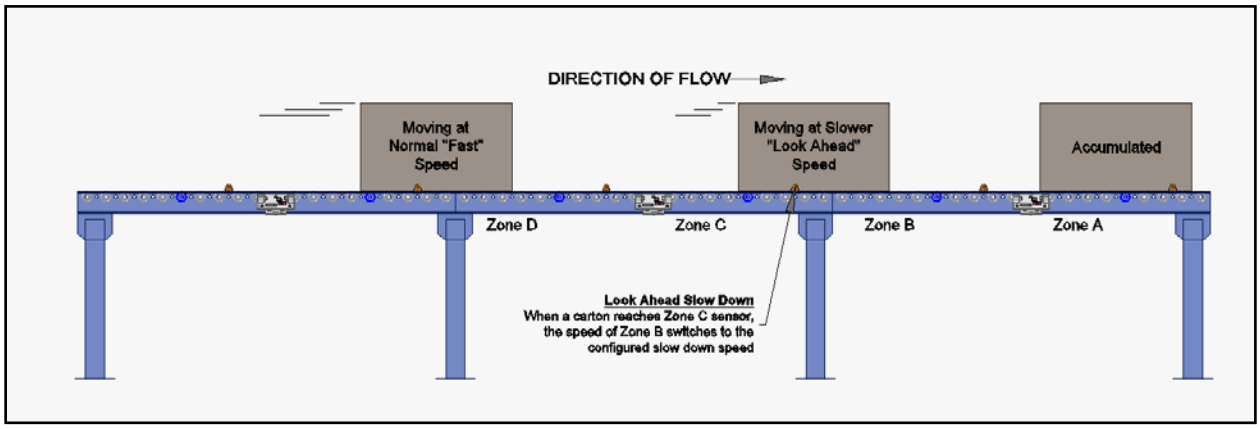
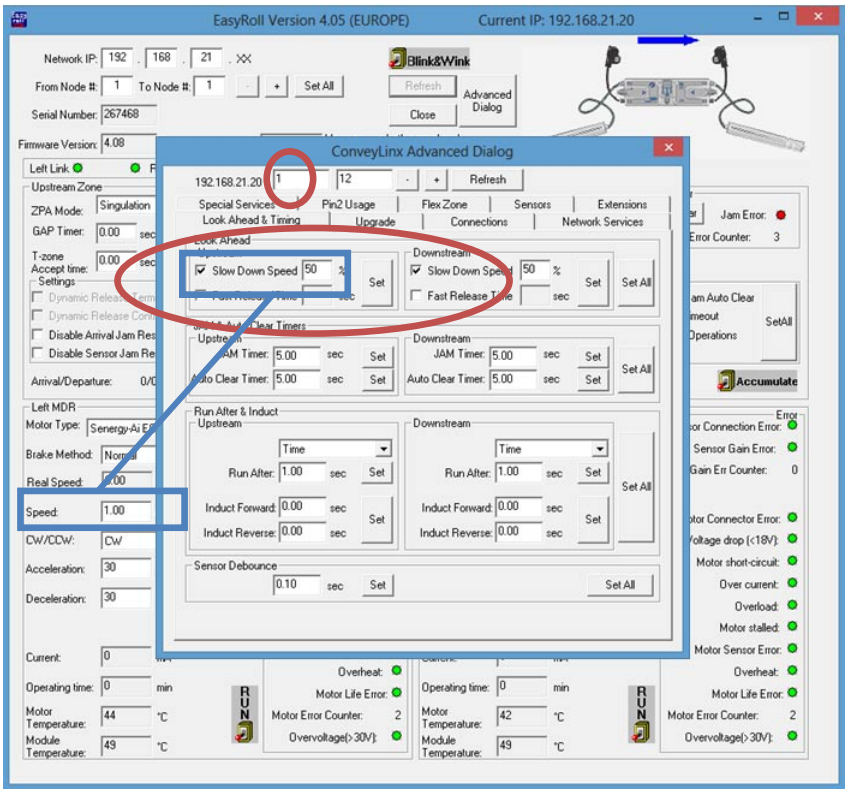


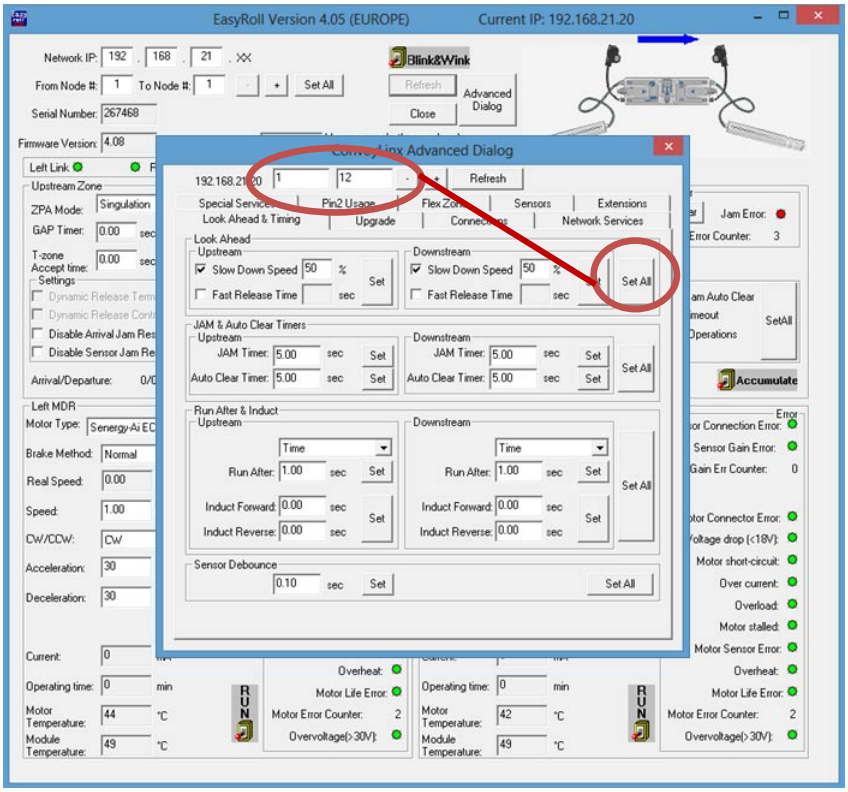
FIGURE 43 - LOOK AHEAD ENABLED

As shown in Figure 43, when a carton arrives at Zone C's photo-sensor, Zone B's *ConveyLinx-Ai2* will automatically adjust the speed of Zone B to the configured *Look Ahead* speed.

Click the checkbox to enable the *Look Ahead* feature for the selected *Node*. Clicking the "Set" buttons will download the setting to the respective zone on the selected *Node*. The value entered for the slowdown speed is in percent of the *Node's* speed as set on the main screen. In this example, the slowdown speed will be proportional to 50% of 0.5 m/s. *(Refer to the Easyroll Tool Pop-Up Dialogue for more detail information regarding Slow Down and Fast Release Time.)*



Clicking "Set All" will enable the *Look Ahead* feature at the % speed entered for all *Nodes* in the range of *Nodes* on the main screen. *(Refer to the Easyroll Tool Pop-Up Dialogue for detailed information regarding Slow Down and Fast Release Time feature.)*



JAM, AUTO CLEAR, AND RUN AFTER TIMERS

The *Jam* timers are used by the logic as the expected time it takes for a load to travel from one zone to the next. If this timer expires before the load reaches the next zone, *ConveyLinx-Ai2* will indicate a Jam condition. Jam condition at any zone will automatically clear once its photo-sensor has been clear for the *Jam* timer value.

If a zone is in a Jam condition and its photo-sensor remains blocked; the photo-sensor must be cleared and remain clear for the *Jam* time value. When a given zone is in a jammed condition, the logic inhibits any upstream loads from entering that zone.

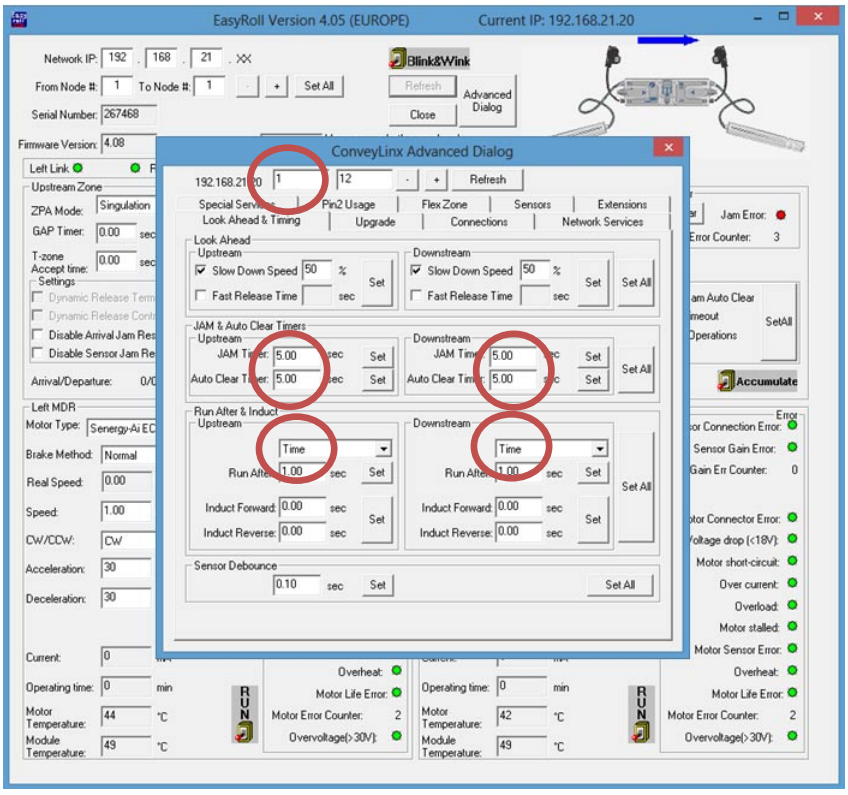
The default value for the *Jam* timer is 5 seconds and the valid range of values for any given *Jam* timer can be found is from 1 seconds to 20 seconds.

The *Auto Clear Timer* is the amount of times that *ConveyLinx-Ai2* waits before trying to clear a jam. After a Jam does occur, it's now possible to set a time to wait before attempting to clear the current jam and trying again.

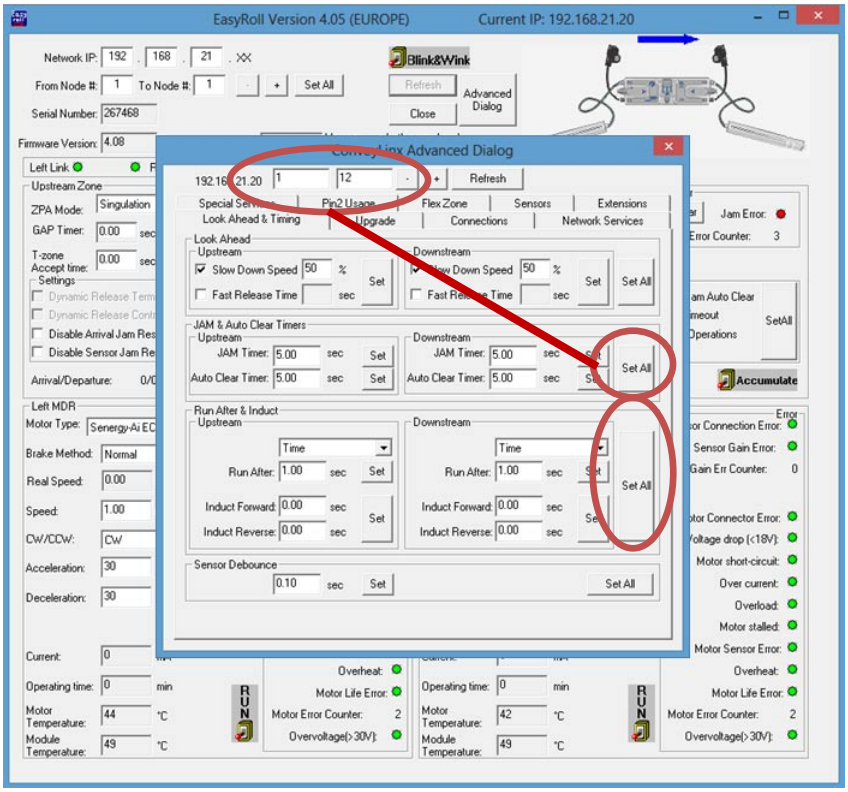
The *Run After* time value is used by the logic for normal zone discharge. This is the amount of time the zone's MDR is to continue run after its photo-sensor has been clear when discharging to the next downstream zone. This extra run time allows the zone to run so that the trailing edge of the carton will completely pass the photo-sensor and fully enter the next zone. This timer value is adjustable to compensate for special conditions where a zone photo-sensor is required to be placed farther upstream or downstream.

The default value for the *Run After* timer is 1 second, the ranges for the *Auto Clear Timer* is from 0 to 10, and the valid range of values for any given *Run After* timer is from 0.1 seconds to 6 seconds.

Clicking any of the "Set" buttons for either *Jam* or *Run After* timers will download the entered setting to the respective zone on the selected *Node*. *(Refer to the EasyRoll Tool Pop-Up Dialogue for detailed information regarding the Jam and Auto Clear Timer settings and functions)*



Clicking "Set All" for either the *Jam* or *Run After* timers will set the entered values for all *Nodes* in the range of *Nodes* on the main screen. *(Refer to the EasyRoll Tool Pop-Up Dialogue for detailed information regarding the Jam and Auto Clear Timer settings and functions)*

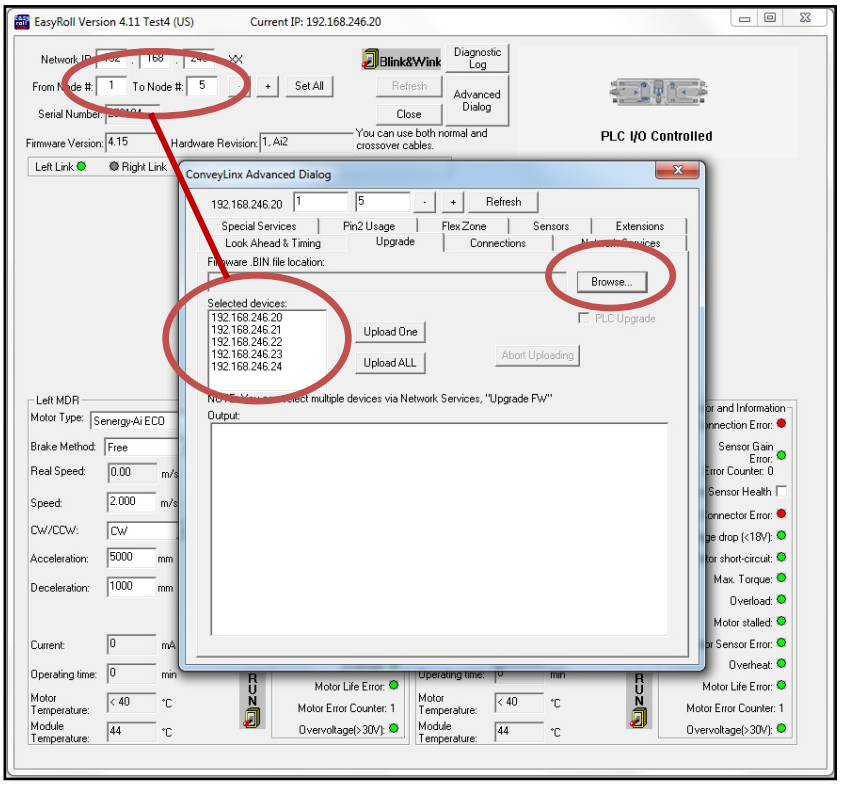


UPGRADE

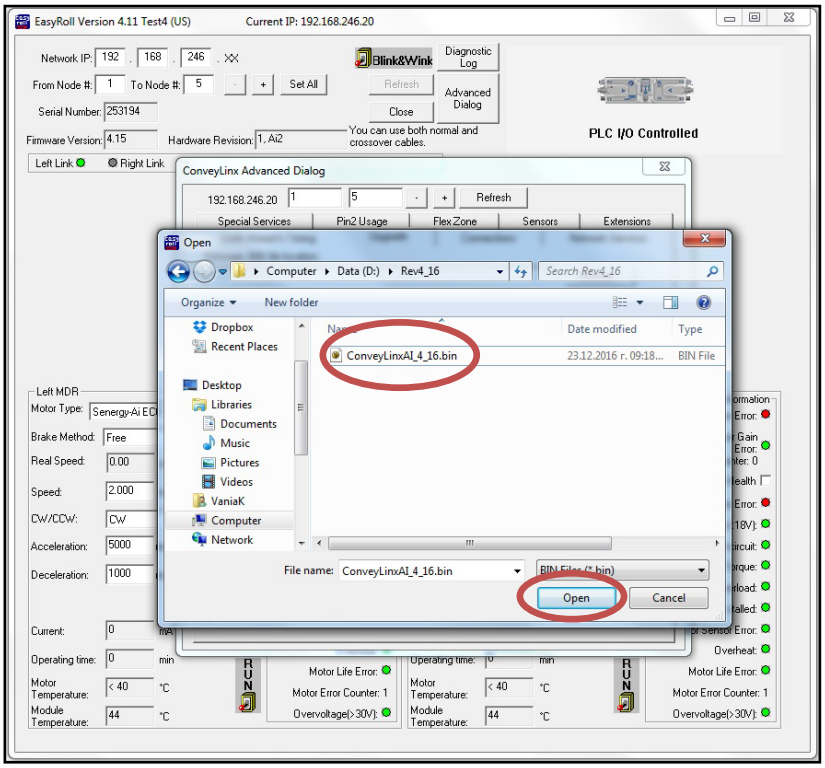
The *Upgrade* tab screen gives access to the *ConveyLinx-Ai2* firmware utility. Over time, enhancements and features may be added to the *ConveyLinx* family of products. These features and enhancements are typically made available to customers in the form of firmware upgrade files that need to be uploaded to your *ConveyLinx-Ai2* modules.

A firmware upgrade will be in the form of a data file sent to you or made available for download. The *Upgrade* utility allows you to browse for this data file and then select a single *Node* or group of *Nodes* to upload.

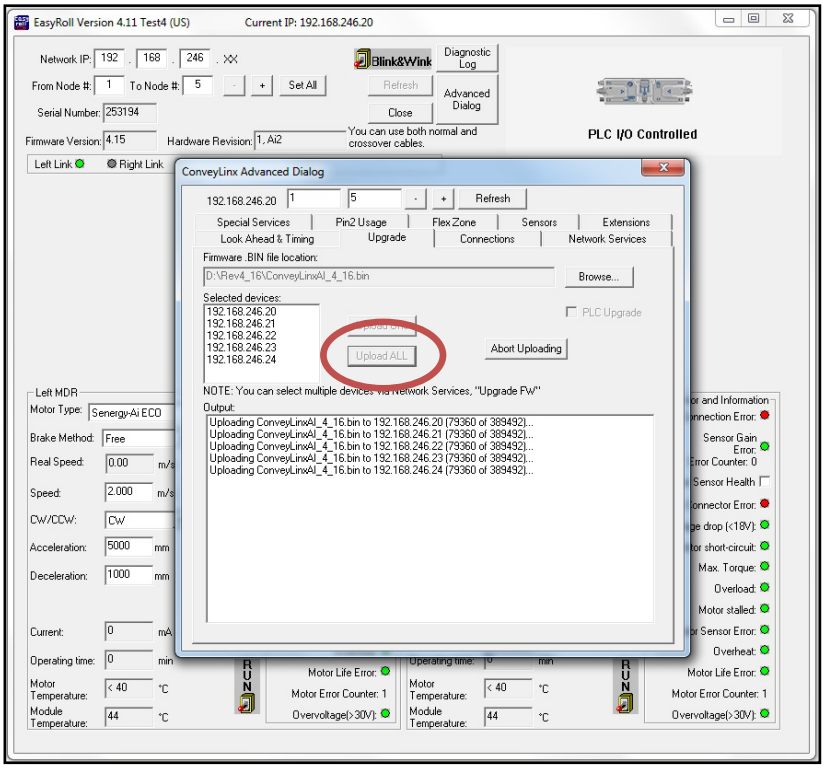
Upon selecting the *Upgrade* screen tab, *EasyRoll* fills in the I.P. address of the range of *Nodes* entered on the main screen. Click the "Browse" button to open a file selection dialog window.



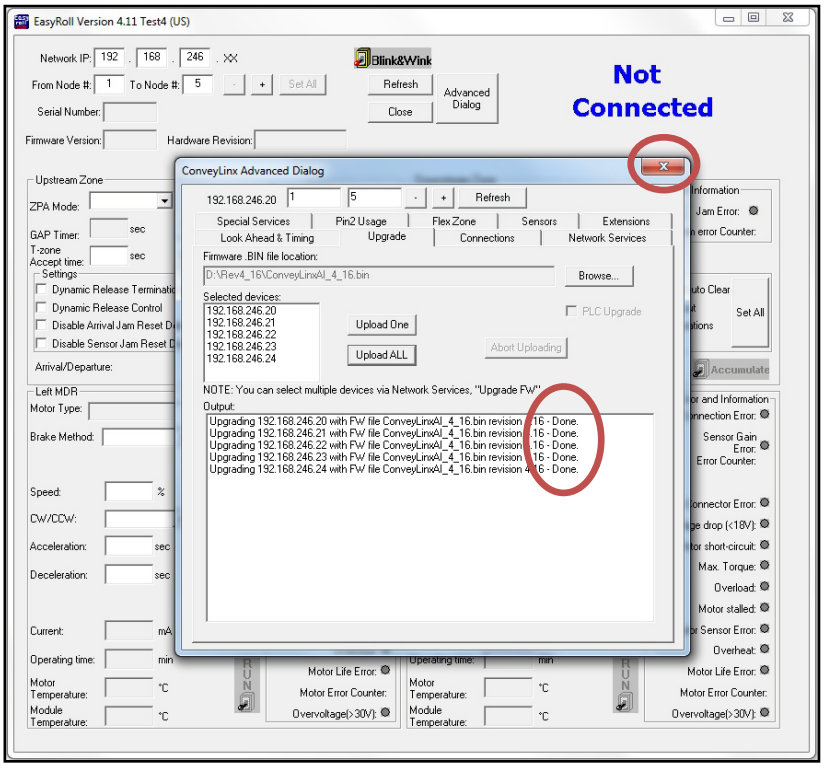
With the "Open" dialog displayed, navigate to the location on your PC where you placed the firmware upgrade file you received. Select the file and click "Open".



In this example, we clicked "Upload ALL" so the selected firmware upgrade file will be sent to all 6 *Nodes*. The "Output" window will update the progress of the file uploading process. The time it takes for this process will vary depending upon how many *Nodes* are being uploaded.



When all *Nodes* report back to the "Output" window with a status of *Done*; then the upload is complete and you can close the *ConveyLinx Advanced Dialog* window.



CONNECTIONS

The *Connections* utility uses *EasyRoll* to instruct a given *ConveyLinx-Ai2* to make a logical connection to another *ConveyLinx-Ai2* that it otherwise would not have made during the *Auto-Configuration Procedure*. For applications where you have more than one *ConveyLinx Subnet*, this would be the way to logically connect the most downstream *Node* of one *Subnet* to the most upstream *Node* of another *Subnet*.

CONNECT TWO NETWORKS TOGETHER

Figure 44 shows a typical boundary between two *Subnets*. The most downstream *Node* of the first *Subnet* has an I.P. address of 192.168.27.25 and the most upstream *Node* of the second *Subnet* has an I.P. address of 192.168.25.20.

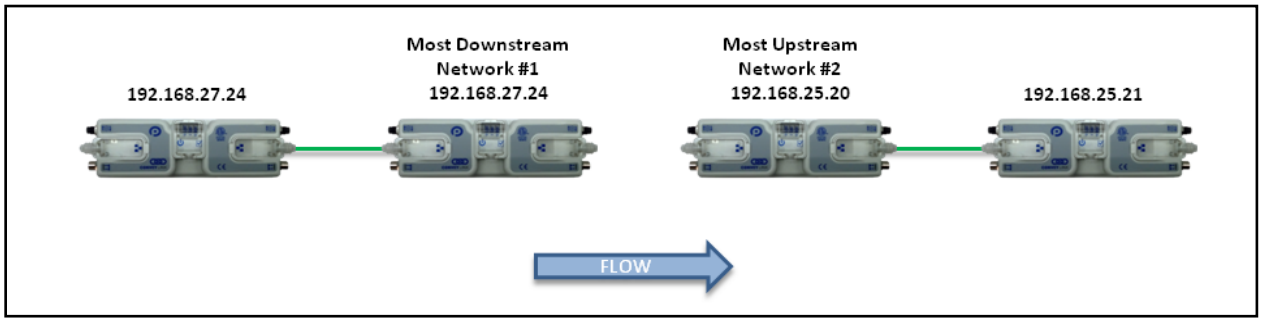


FIGURE 44 - SUBNET BOUNDARY EXAMPLE

By simply connecting a crossover Ethernet cable between these two boundary *Nodes* and then using *EasyRoll* establish the "logical" connection between the two *Subnets*; you can achieve seamless flow between the two networks. This is shown in Figure 45.

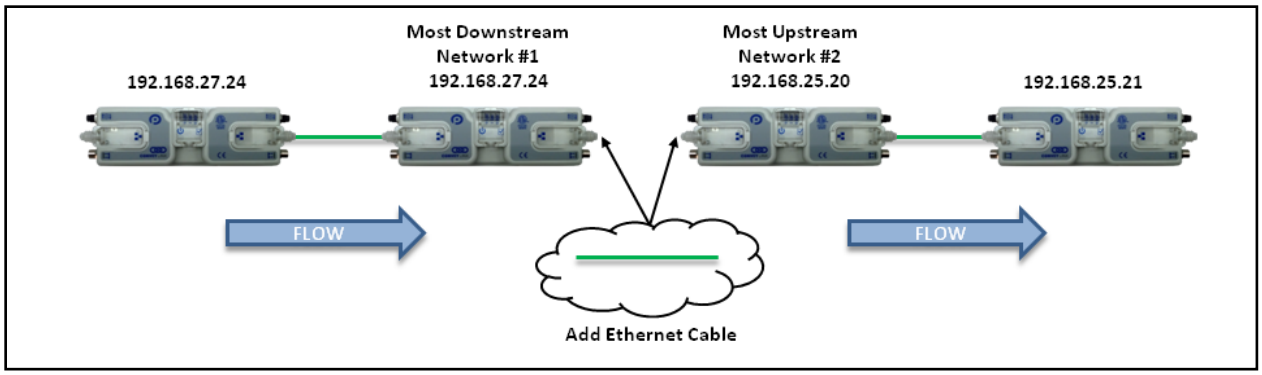
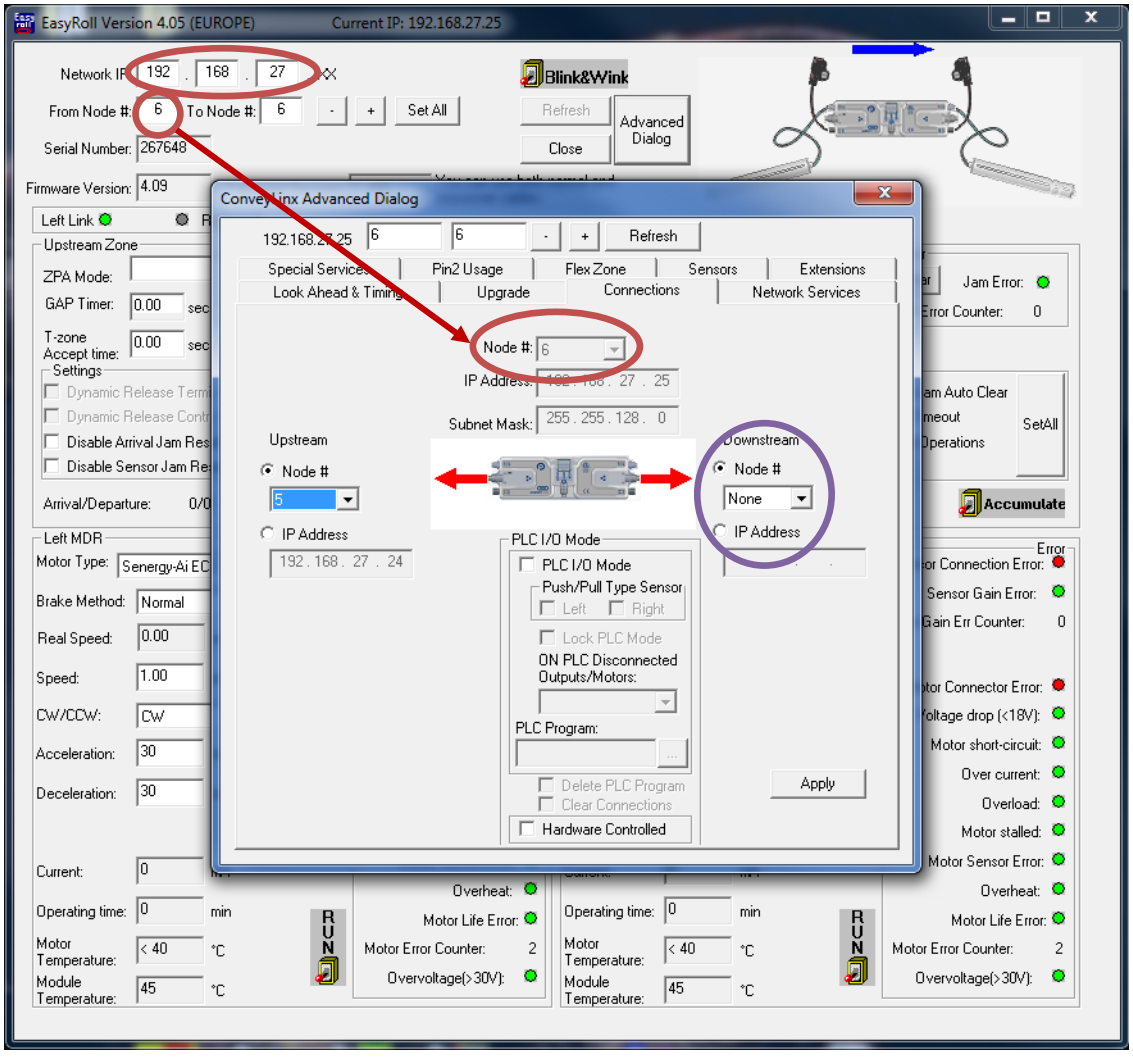


FIGURE 45 - SUBNET BOUNDARY EXAMPLE WITH CABLE

The procedure requires that you have to instruct *Node* at 192.168.27.25 to convey loads to *Node* at 192.168.25.20, and likewise you have to instruct *Node* at 192.168.25.20 to accept loads from *Node* at 192.168.27.25.

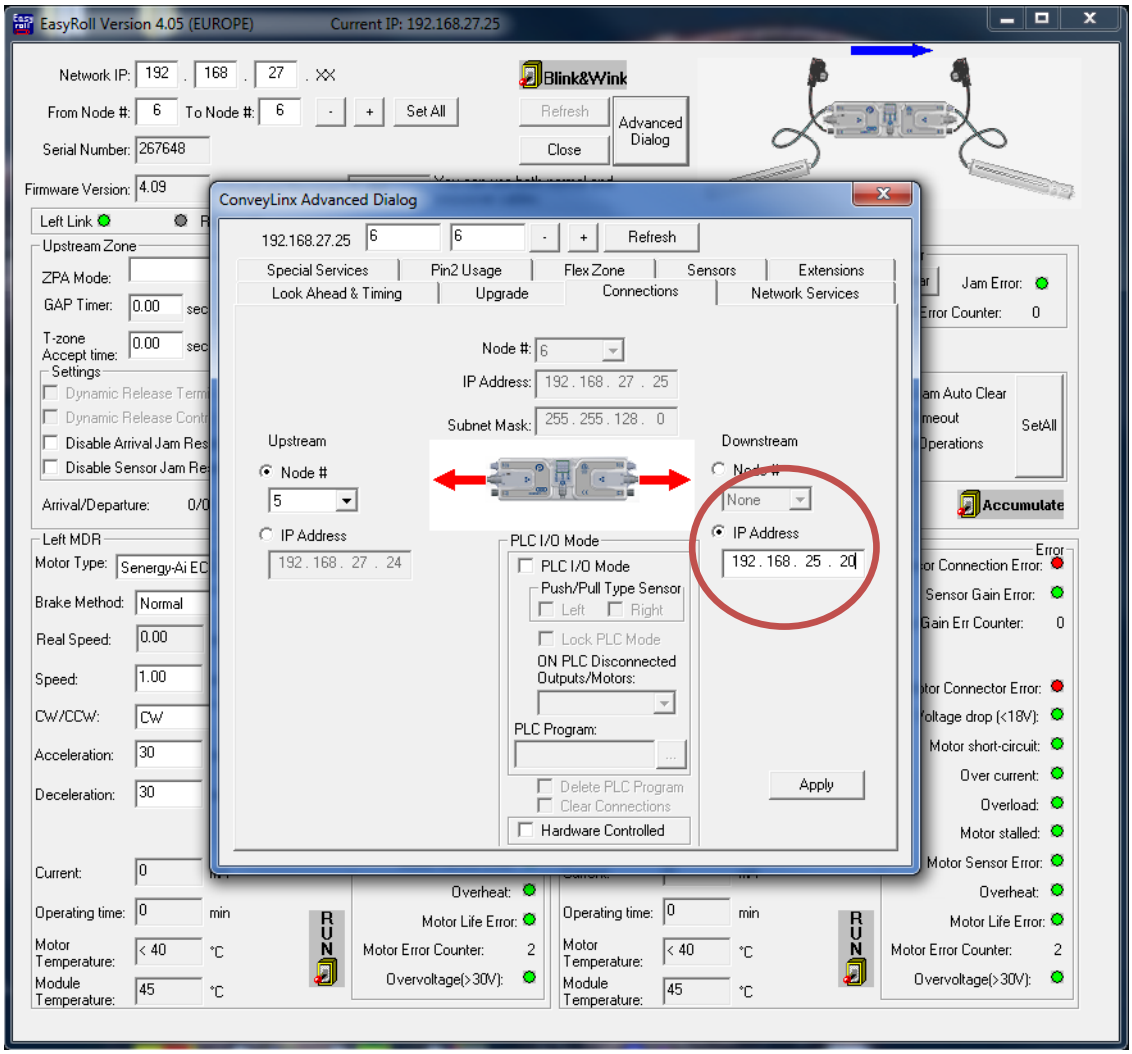
Configuring *Node* at 192.168.27.25



From the main screen, first enter the correct *Subnet* into the "Network IP" boxes and the correct *Node* you want to connect. In this case we know that xxx.xxx.xxx.25 is *Node* 6 for this particular *Subnet*.

Invoke the *ConveyLinx Advanced Dialog* and select the *Connections* tab.

Note that the *Node* is being viewed is in the center and it is greyed out. Also note that its Downstream designation indicates "None".



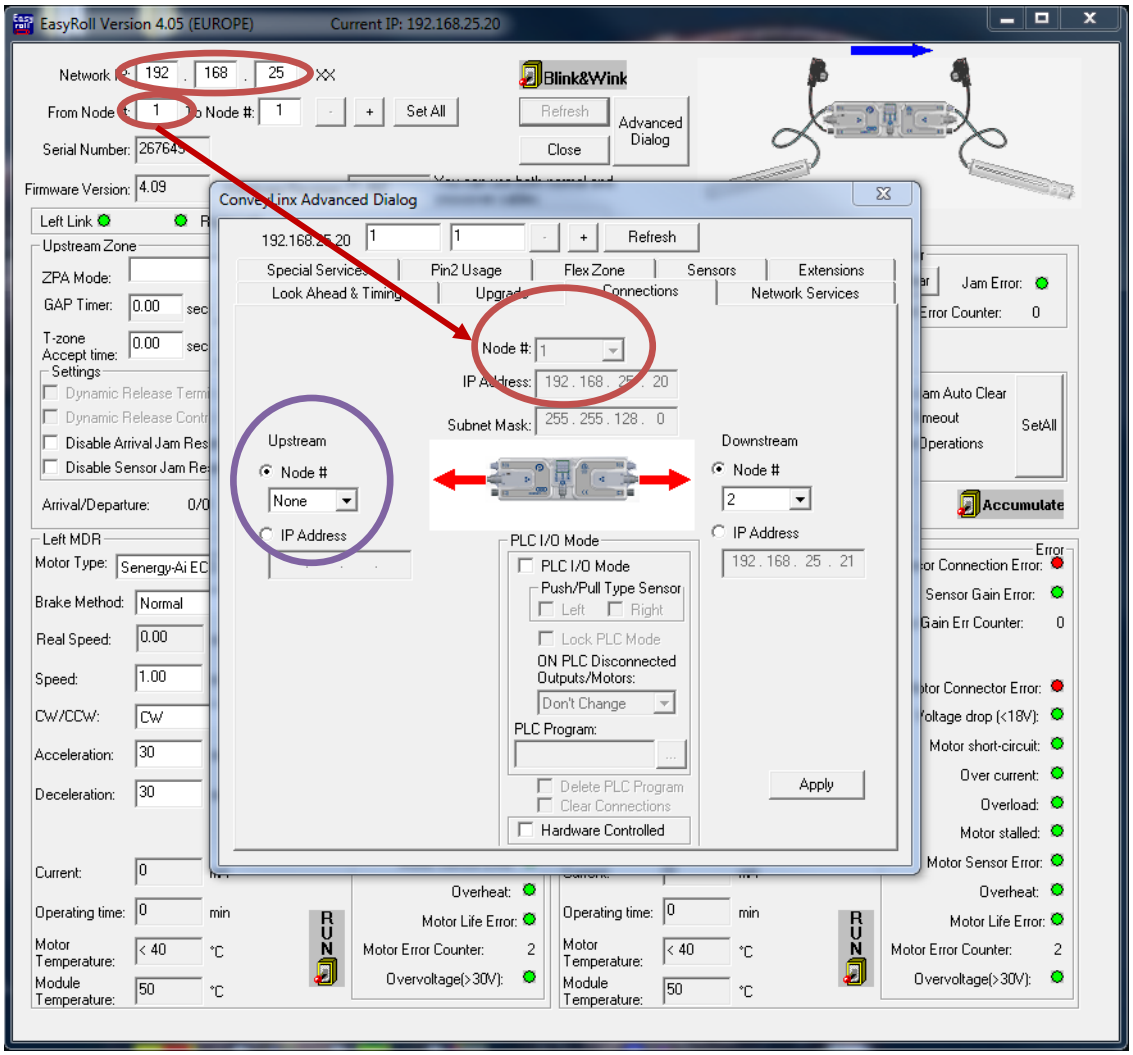
We want to change the Downstream flow to I.P. address 192.168.25.20 which is the next downstream *Node*.

Click the IP Address button and enter the correct I.P. address value and click the "Apply" button.

Please note that this will take approximately 20 seconds for the module to accept the change and then the module will automatically restart.

At this point we are half-way complete in that we now have to instruct the downstream module to accept from upstream.

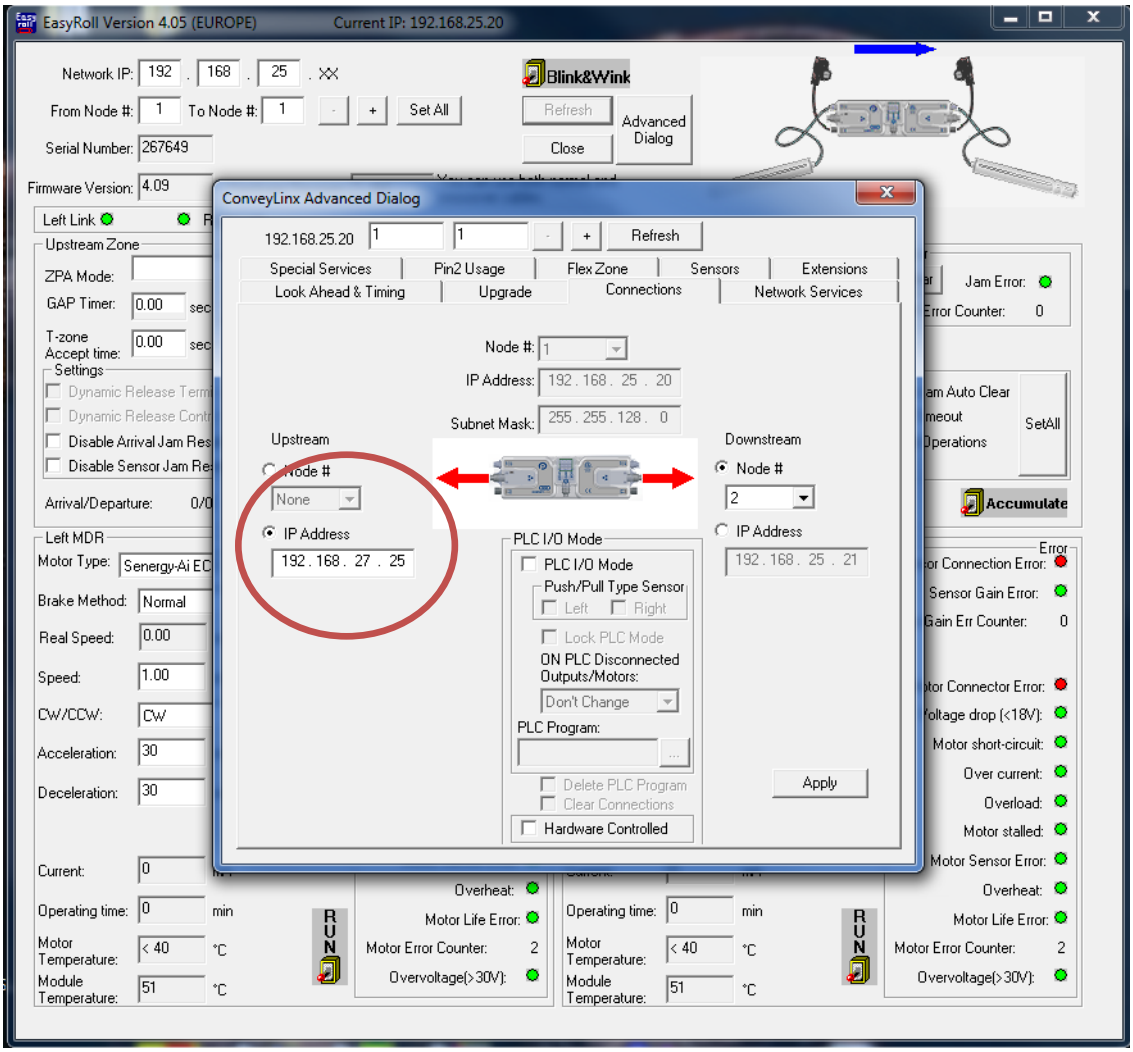
Configuring *Node* at 192.168.25.20



From the main screen, first enter the correct *Subnet* into the "Network IP" boxes and the correct *Node* you want to connect. In this case we know that xxx.xxx.xxx.20 is *Node* 1 for this particular *Subnet*.

Invoke the *ConveyLinx Advanced Dialog* and select the *Connections* tab.

Note that the *Node* is being viewed is in the center and it is greyed out. Also note that its Upstream designation indicates "None".



We want to tell this *Node* to accept loads from I.P. address 192.168.27.25 which is the next upstream *Node*.

Click the IP Address button and enter the correct I.P. address value and click the "Apply" button.

Please note that this will take approximately 20 seconds for the module to accept the change and then the module will automatically restart.

Now we are complete and loads should flow from *Node* at 192.168.27.25 to *Node* at 192.168.25.20

The above example requires that your PC can access multiple *Subnets*. Please refer to *Appendix C–Configuring PC for Ethernet Subnets* for further details.

Further description and application examples of Ethernet networked solutions are included in separate Insight Automation publication *ConveyLinx Developer's Guide*(publication *ERSC-1500*)

Network Services

The *Network Services* screen is used to both explore any networks reachable by the PC for any *ConveyLinx-Ai2* modules and it is used to set the I.P. address of a selected *ConveyLinx-Ai2.* Refer to section *Using the Network Services Utility* on page 56 for details.

Special Services

Each *ConveyLinx-Ai2* maintains a running time meter for each MDR connected to it. This value is displayed as *Operating Time* on the main screen (see Figure 35). This screen on the *ConveyLinx Advanced Dialog* allows you to reset this meter in the event you have to replace a given MDR.

Another function on the *Special Services* screen is a button used to clear an MDR short circuit error. This particular error is not logically cleared based upon an elapsed period timeout or other such reset. An MDR short circuit error requires that either the *ConveyLinx-Ai2* be powered down and then powered back up or by clicking the "Reset" button on this screen. This function is made available in *EasyRoll* as a convenience so you don't have to cycle the power on the *ConveyLinx-Ai2*.

The last function on the *Special Services* screen is *Touch and Go*. This function, when enabled, allows the MDR to detect motion on the roller surface and to use this to signal a zone wake-up condition. For example an operator can place a carton in the zone and give it a gentle push in the direction of flow and the zone will automatically wake-up. There are check boxes for both the upstream and downstream zones to enable this function per zone.

Sensor Port Aux I/O Pin 2 Usage

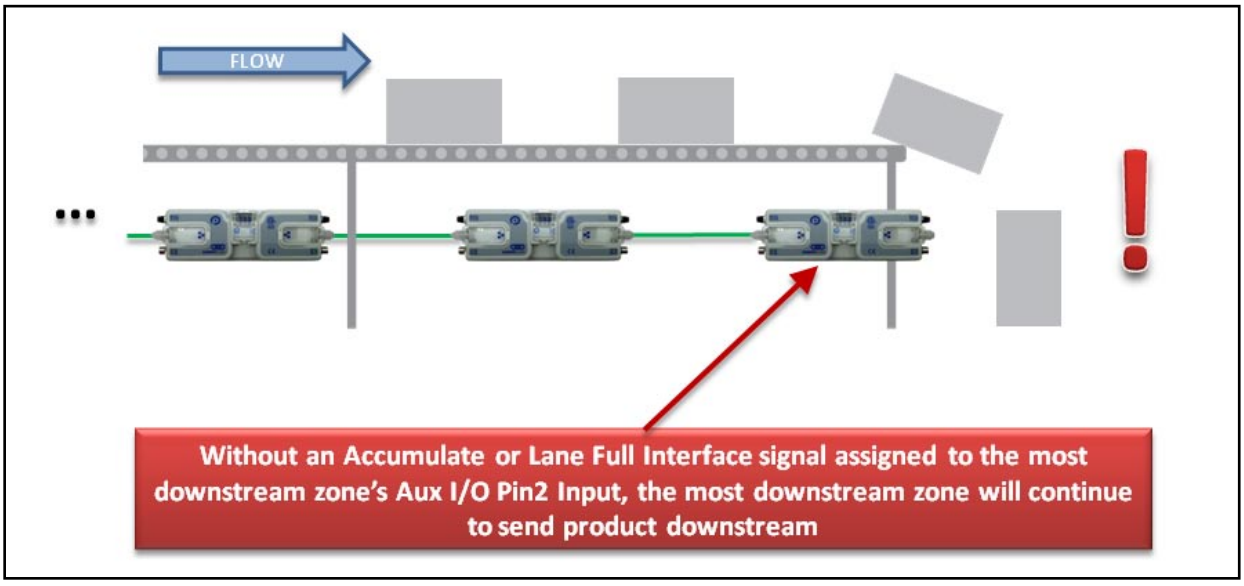
Pin 2 on each of the two *Sensor* port's M8 connector on the *ConveyLinx-Ai2* is configurable as to its potential function. This pin can function as either an input or an output. The default "out-of-the-box" usage for Pin 2 is "Not Used". Using the *Pin 2 Usage* screen from the *ConveyLinx Advanced Dialog* allows you to select one of the following functions for each zone on the module:

- None: Ignore any input signal on Pin 2
- Accumulate: Input for local zone accumulate command
- Wake up: Input for local zone wake-up signal
- Wake-up with Timeout
- Lane Full Interface: Input for local Lane Full Interface signal
- Module Error Output
- Product on Zone Output
- Sensor Error Output
- Mirror Pin 4

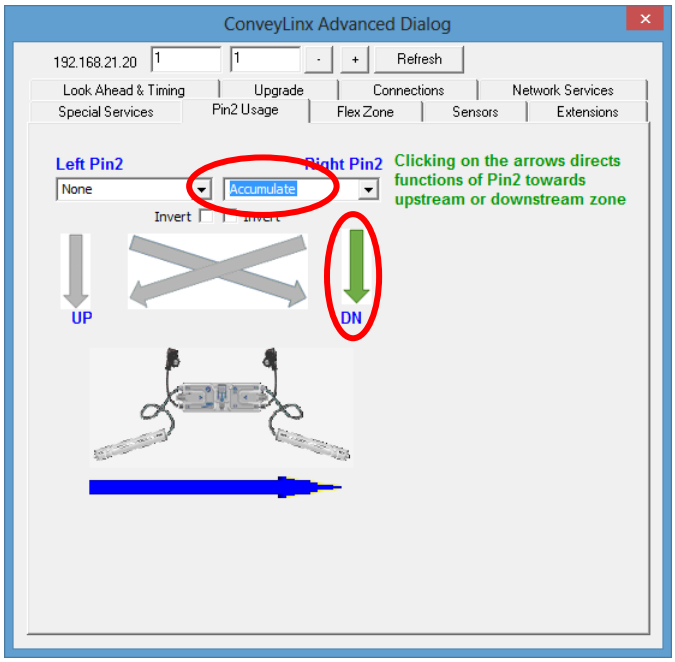
Depending on how the module is configured, you can independently select which of these functions you want to reside on which of the 2 sensor port's Pin 2 signals.

Most Downstream Zone

Please note that by default and without any intervention, the most downstream zone will always try to discharge product. To control this you need to utilize the Aux I/O Pin 2 signal for the most downstream zone as an Accumulate input.

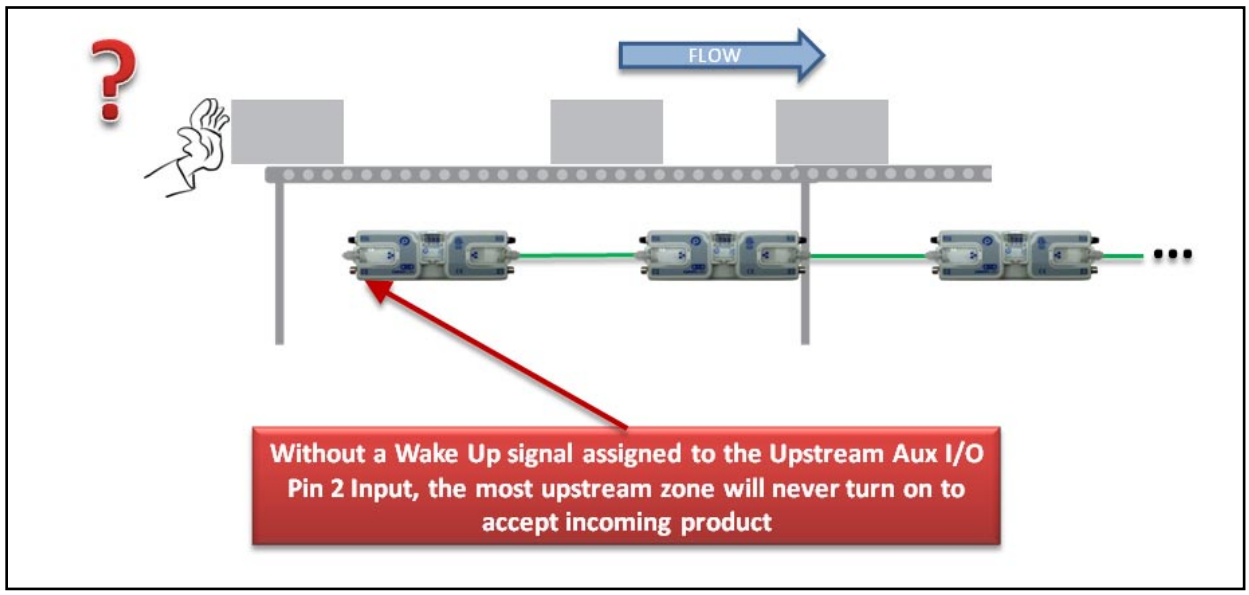


Assuming the most downstream zone is connected to the right side of the module; we set the Right Aux I/O Pin 2 to “Accumulate” from the drop down box and make sure we click the “DN” arrow to indicate that the Right Pin 2 signal is to be associated with the Downstream Zone. When the Right Pin 2 signal is energized, the downstream zone will stop when an item arrives on its sensor.

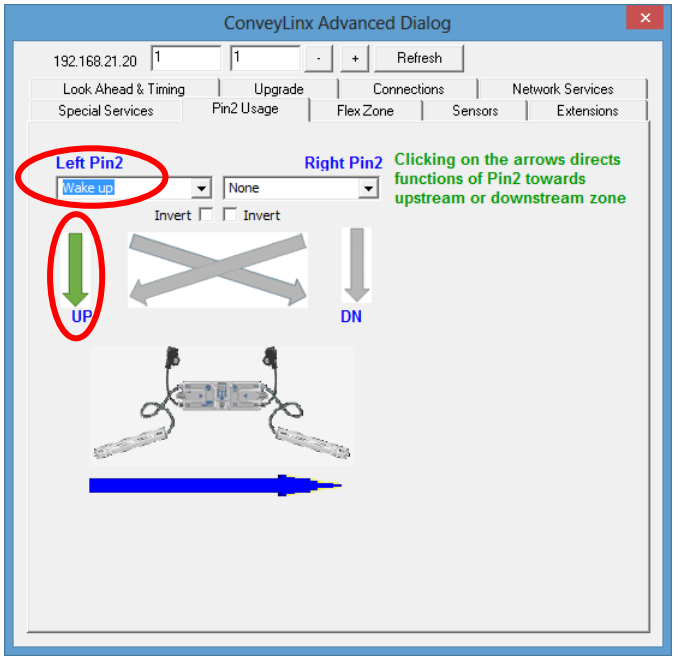


Most Upstream Zone

Similarly, by default and without any intervention, the most upstream zone will never turn on to accept new product. To cause the most upstream zone to run to accept an item with a wired signal, you need to utilize the Aux I/O Pin 2 for the upstream zone as a Wake up input.

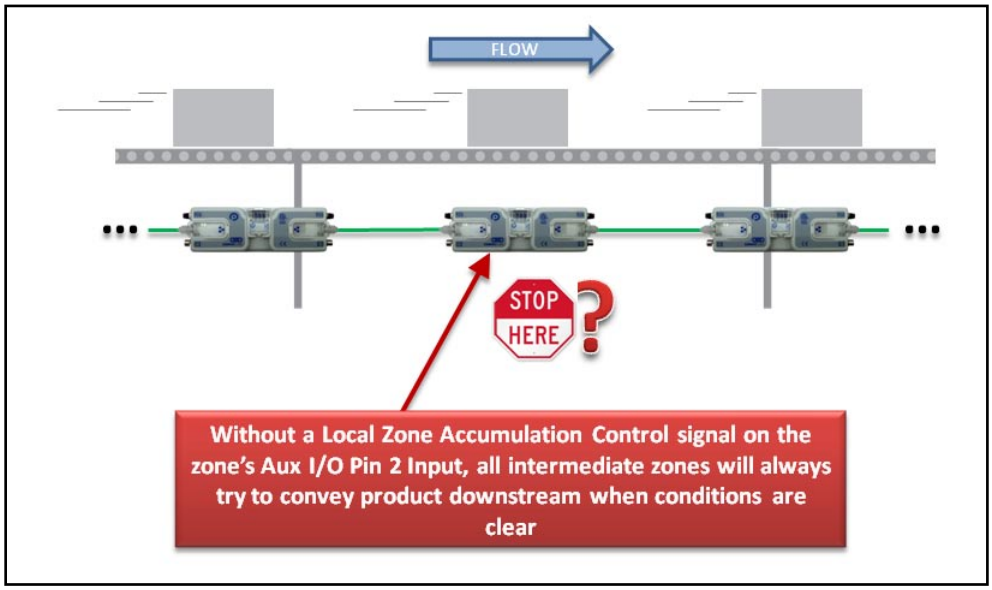


Assuming the most upstream zone is connected to the left side of the module; we set the Left Pin 2 to "Wake up" from the drop down box and make sure we click the "DN" arrow to indicate that the Left Pin 2 signal is to be associated with the Upstream Zone. When the Left Pin 2 signal is energized, the upstream zone will run to accept an item.

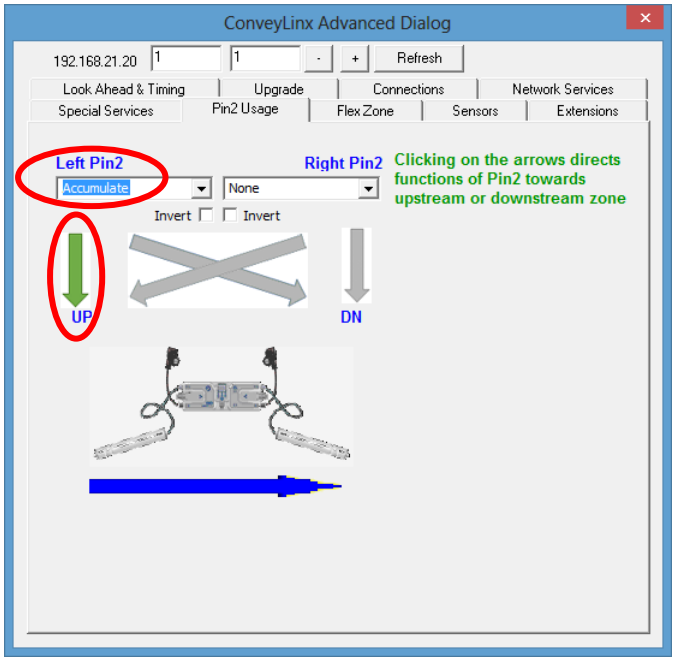


ACCUMULATE INTERMEDIATE ZONE

By default and without intervention; all zones in between the most upstream and most downstream zones always try to convey items downstream as long as the next downstream zone is clear. To cause an intermediate zone to accumulate based upon a wired signal, you need to utilize the Aux I/O Pin 2 signal for the zone in questions as an Accumulate input.



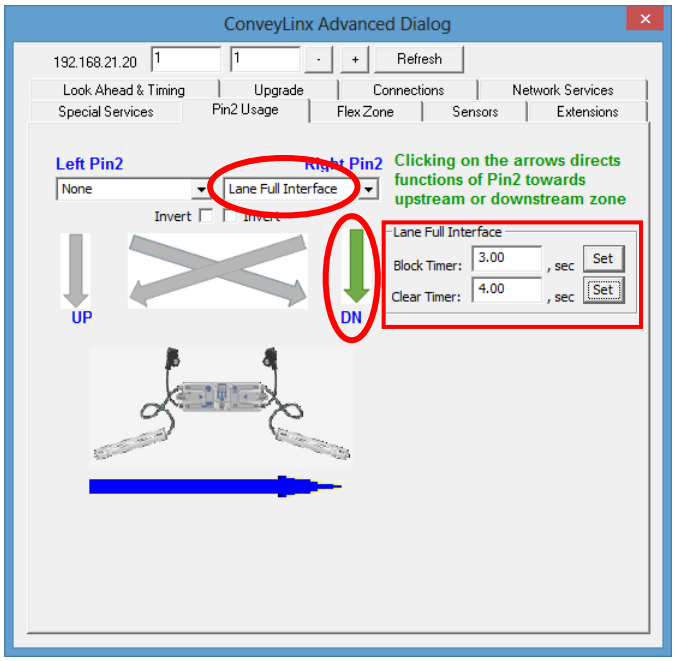
Assuming the intermediate zone we want to accumulate is the upstream zone and the upstream zone is connected to the Left side of the module; we set the Left Aux I/O Pin 2 to "Accumulate" from the drop down box and make sure we click the "UP" arrow to indicate that the Left Pin 2 signal is to be associated with the Upstream Zone. When the Left Pin 2 is energized, the upstream zone will accumulate the next item that arrives.



LANE FULL INTERFACE

A special case of the accumulate signal for the most downstream zone is referred to as Lane Full Interface. When Lane Full Interface is used on the most downstream zone; the input signal is treated with a block and clear timer such that when the signal is energized, the signal must remain energized for the "block" timer duration. When the block timer expires, then the zone is set to accumulate. Similarly, when the signal is de-energized, the signal must remain de-energized for the "clear" timer duration. When the clear time expires, the zone is set to release as normal. The Lane Full Interface also disables the Arrival Jam detection logic such that no arrival verification signal from downstream is required. This means that as long as the signal is on (and the block time has expired) items arriving at the most downstream sensor will immediately release.

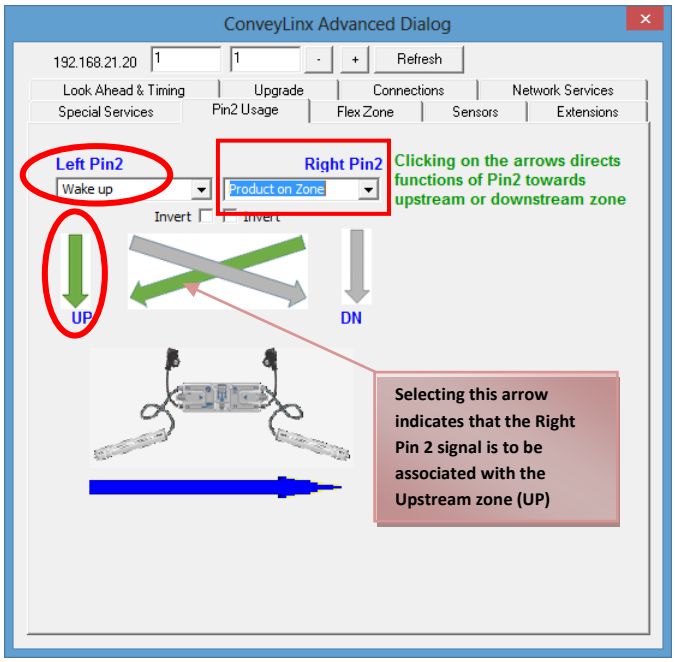
Assuming the most downstream zone is connected to the right side of the module; we set the Right Aux I/O Pin 2 to "Lane Full Interface" from the drop down box and make sure we click the "DN" arrow to indicate that the Right Pin 2 signal is to be associated with the Downstream Zone. In our example we entered 3 seconds for the Block Time and 4 seconds for the Clear Time.



MOST UPSTREAM ZONE HANDSHAKE INTERLOCK

In applications where the equipment feeding the most upstream zone of ConveyLinx-Ai2 controlled conveyor requires a handshake interlock to know when the most upstream zone of the ConveyLinx-Ai2 controlled conveyor is empty and ready to accept a new item, this can be achieved by utilizing both the Left and Right Aux I/O Pin signals. One of the Aux I/O Pin 2 signals needs to be set as an input to Wake Up the zone and the other sginal needs to be configured as an output to indicate whether there is Product on Zone. When this Product on Zone output is energized, then the feeding equipment knows that the most upstream zone is occupied and is not ready to accept a new item.

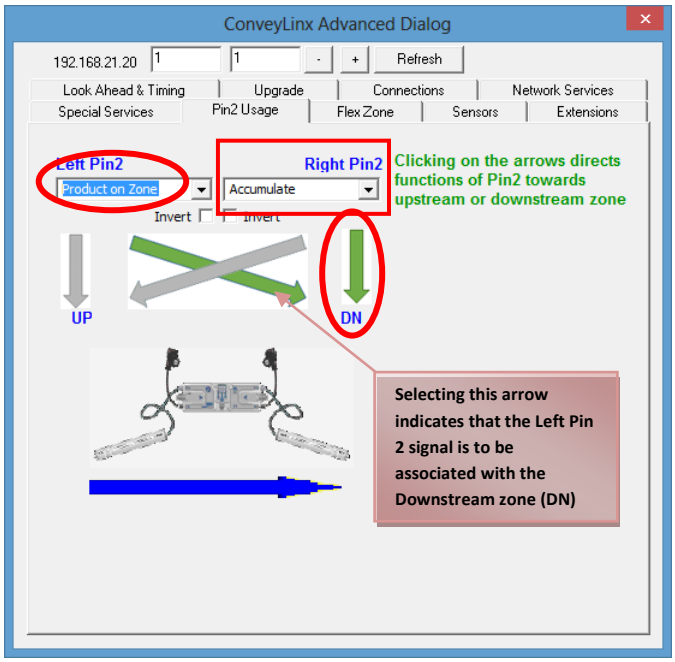
Assuming the most upstream zone is connected to the left side of the module; we set the Left Pin 2 to "Wake Up" from the drop down box and make sure we click the "UP" arrow to indicate that the Left Pin 2 signal is to be associated with the Upstream Zone. Similarly we select "Product on Zone" for the Right Pin 2 signal and click the diagonal arrow to indicate that this signal is to reflect the status of the Upstream zone.



Most Downstream Zone Handshake Interlock

In applications where the equipment accepting product from the most downstream zone of ConveyLinx-Ai2 controlled conveyor requires a handshake interlock to know when the most downstream zone of the ConveyLinx-Ai2 controlled conveyor is occupied and ready to discharge the item, this can be achieved by utilizing both the Left and Right Aux I/O Pin signals. One of the Aux I/O Pin 2 signals needs to be set as an input to Accumulate the zone and the other signal needs to be configured as an output to indicate whether there is Product on Zone. When this Product on Zone output is energized, then the accepting equipment knows that the most downstream zone is occupied and is ready to discharge the item.

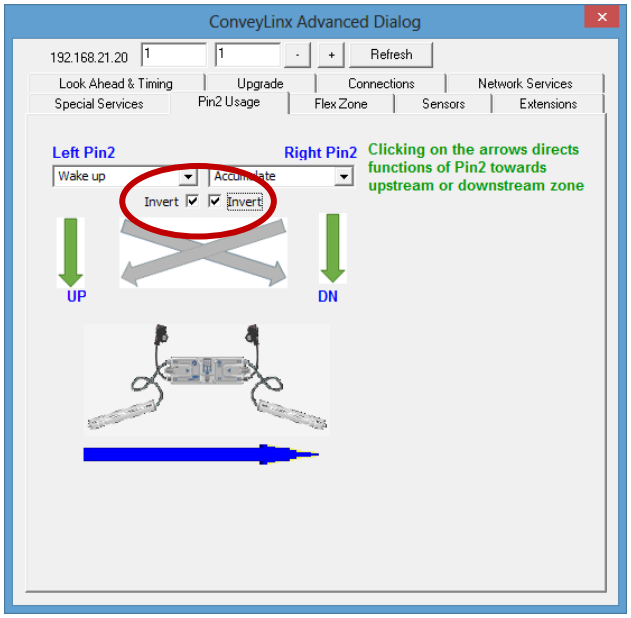
Assuming the most downstream zone is connected to the right side of the module; we set the Right Pin 2 to "Accumulate" from the drop down box and make sure we click the "DN" arrow to indicate that the Right Pin 2 signal is to be associated with the Downstream Zone. Similarly we select "Product on Zone" for the Left Pin 2 signal and click the diagonal arrow to indicate that this signal is to reflect the status of the Downstream zone.



INVERTING THE AUX I/O PIN 2 SIGNALS

On this dialog, you can also invert the meaning of the electrical signal by checking the "Invert" box for either or both Pins. In this example, because we have the Invert box checked for both Pin signals, their respective functions will be activated when their signal is electrically OFF.

Note that the Invert function works similarly for the output signals. If "Product on Zone" is selected as a function, with the Invert box checked when the zone is occupied, the electrical signal will be OFF. With the Invert box checked, when the zone is clear, the electrical signal will be ON.



Please refer to Appendix B - IOX-2Breakout Module beginning on page 99 for details on connecting and wiring devices for access to Aux I/O Pin 2 signals

FLEX ZONE

ConveyLinx-Ai2 modules will automatically detect that a given carton is longer than one zone length and automatically adjust accumulation control so that the longer carton occupies two logical zones and will keep the next upstream carton from conveying into the longer carton. . This tab allows you to either enable or disable the feature.

Please note that Flex Zone function has to be enabled or disabled for the entire subnet. It cannot be disabled or enabled on a per zone basis or for group of zones within the same subnet.

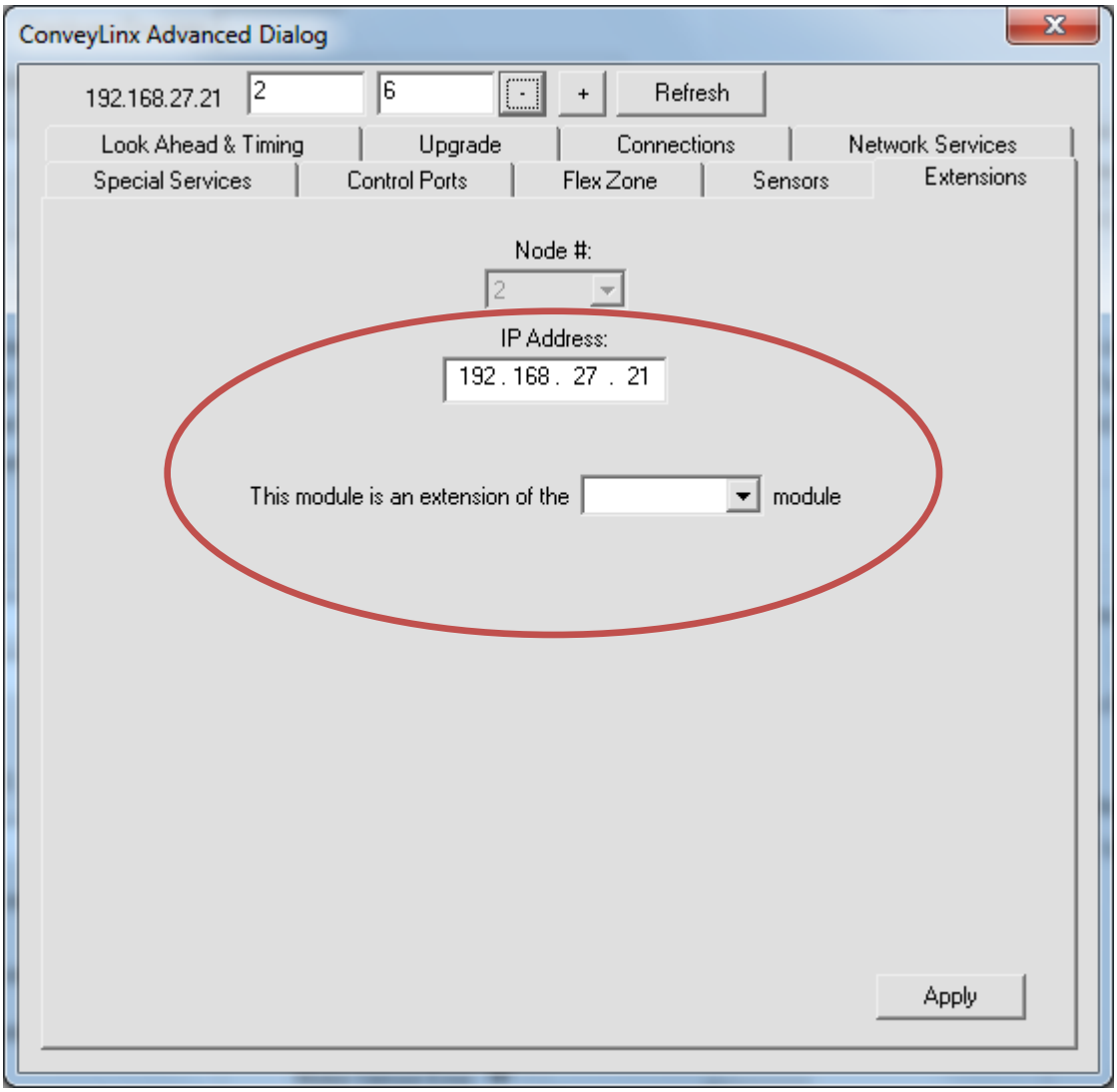
Flex Zone functionality is only applicable for Singulation Release mode. Flex Zone may not operate properly when using Train or Gap Train release modes.

SENSORS

The sensors tab displays the status of how the sensor was configured during the initial "Auto Configuration" of the system. For example, if all the sensors on the system are light energized normally open then the corresponding zone's sensor will show "off blocked". Use this tab to change each modules default sensor configuration to match what is existing. *Please refer to the EasyRoll Tool's self-help pop up dialog for more details regarding changing the sensor's or sensor's error state after auto-configuration.*

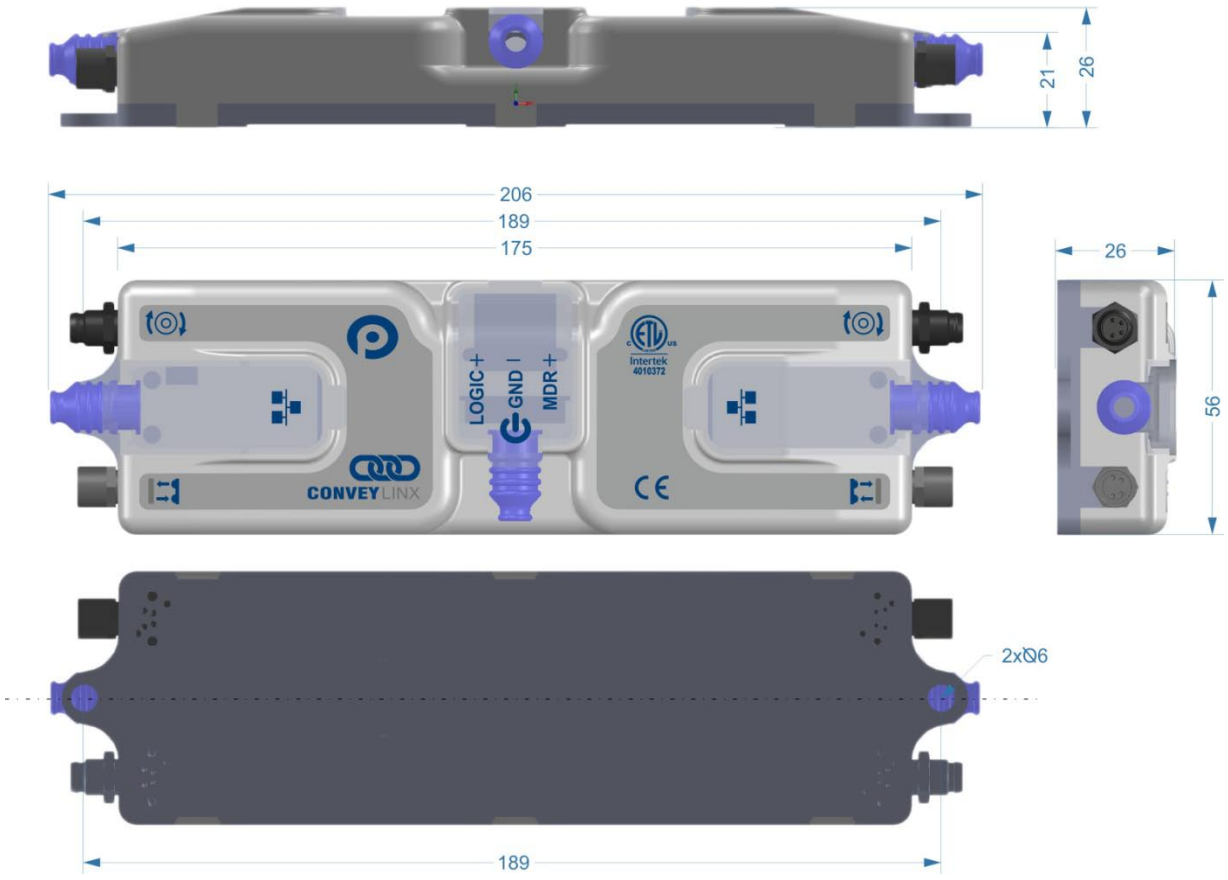
EXTENSIONS

The Extension tab allows you to extend or "slave" a single or multiple zones to one "master" zone. By going to the upstream or downstream node of the module you'd like to extend you can select "This module (*current node*) is an extension of the downstream or upstream (*node that you'd like for the current node to extend to*). One example of extensions in use can be found in the appendix section *Using Extensions for a Lift Gate on page 109.* You can also refer to the EasyRoll Tool Pop-Up dialog for detailed description of operation when checking this option in Control Ports.


ConveyLinx Advanced Dialog
192.168.27.21
2
6
-
+
Refresh
Look Ahead & Timing
Upgrade
Connections
Network Services
Special Services
Control Ports
Flex Zone
Sensors
Extensions
Node #:
2
IP Address:
192 . 168 . 27 . 21
This module is an extension of the
module
Apply

APPENDIX A – MODULE DIMENSIONS

Dimensions in mm



APPENDIX B - IOX-2BREAKOUT MODULE

The IOX-2breakout module provides a convenient plug and play means to separate the zone sensor and Aux I/O signals on the ConveyLinx-Ai2 module's sensor port. The IOX-2 utilizes M8 style connection headers so you can connect your M8 style zone sensor as well as M8 style cable (or additional sensor) for access to the Aux I/O Pin 2 signal. The IOX-2 also contains wire terminal access for the Aux I/O Pin 2 signals for complete flexibility.

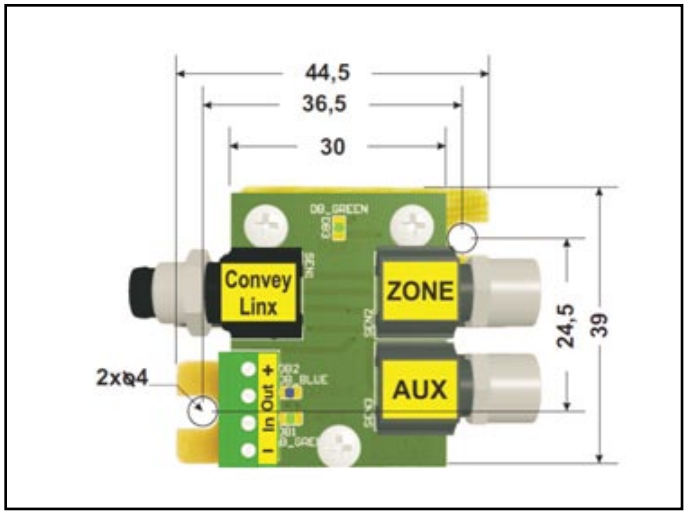


FIGURE 46 - IOX-2 MODULE (DIMENSIONS IN MM)

The following figures illustrate the typical usage and connection details for Aux I/O ConveyLinx-Ai and ConveyLinx-Ai2 applications

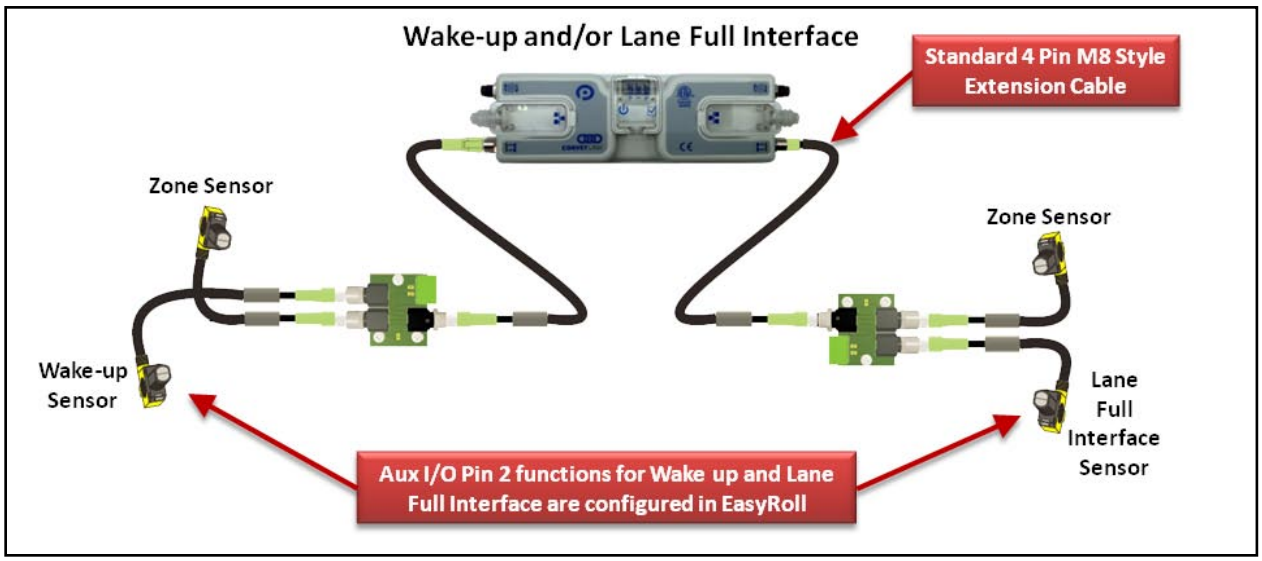


FIGURE 47 - WAKE UP AND LANE FULL INTERFACE SENSORS AS M8 STYLE

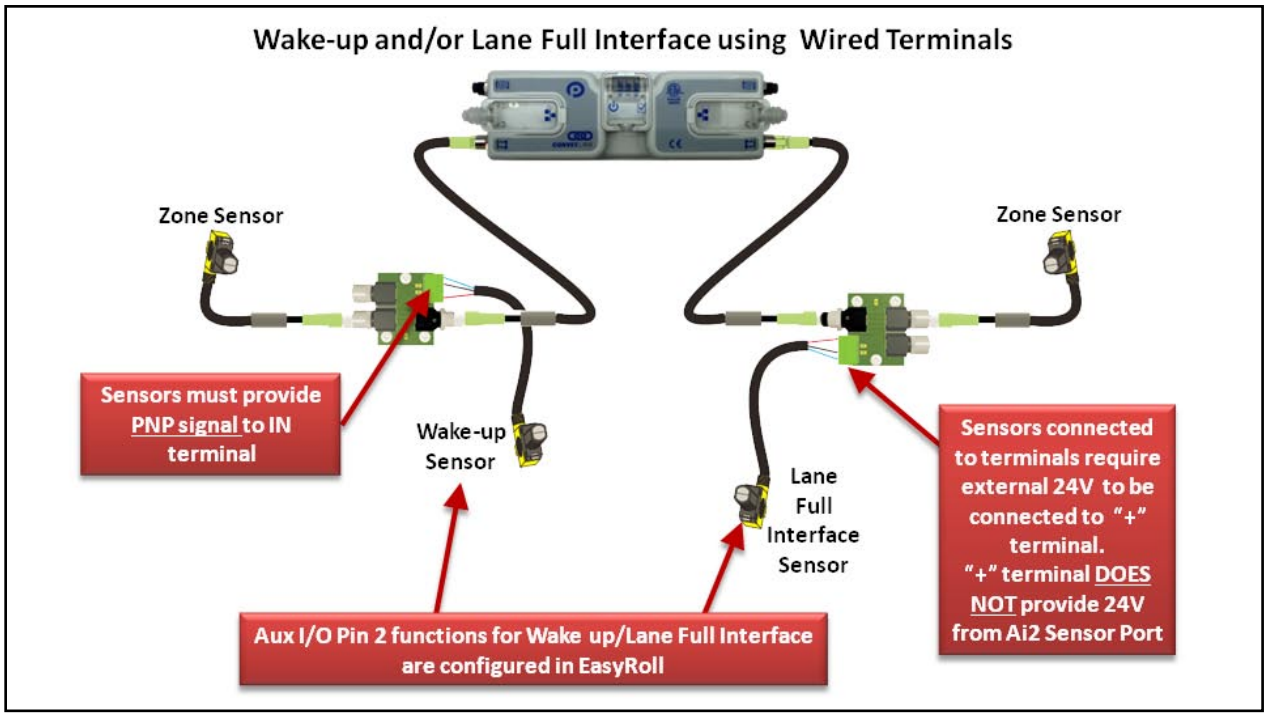


FIGURE 48 - WAKE UP AND LANE FULL INTERFACE SENSORS CONNECTED TO WIRE TERMINALS

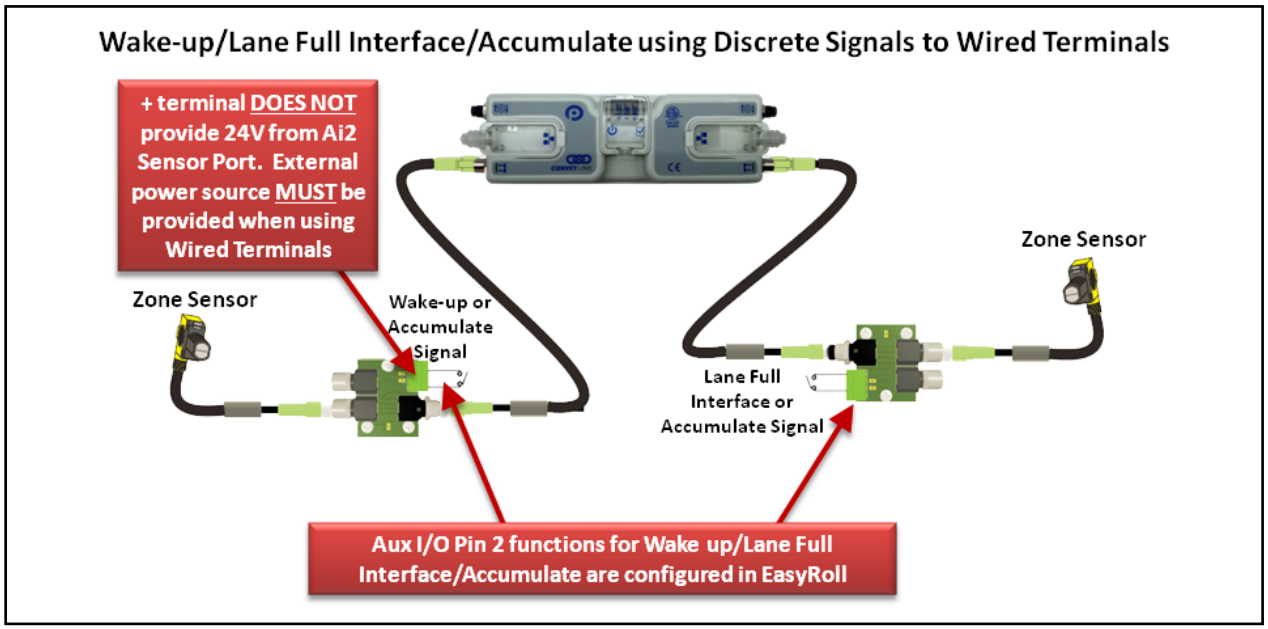


FIGURE 49 - WAKE UP AND LANE FULL INTERFACE SIGNALS AS DEVICE CONTACTS

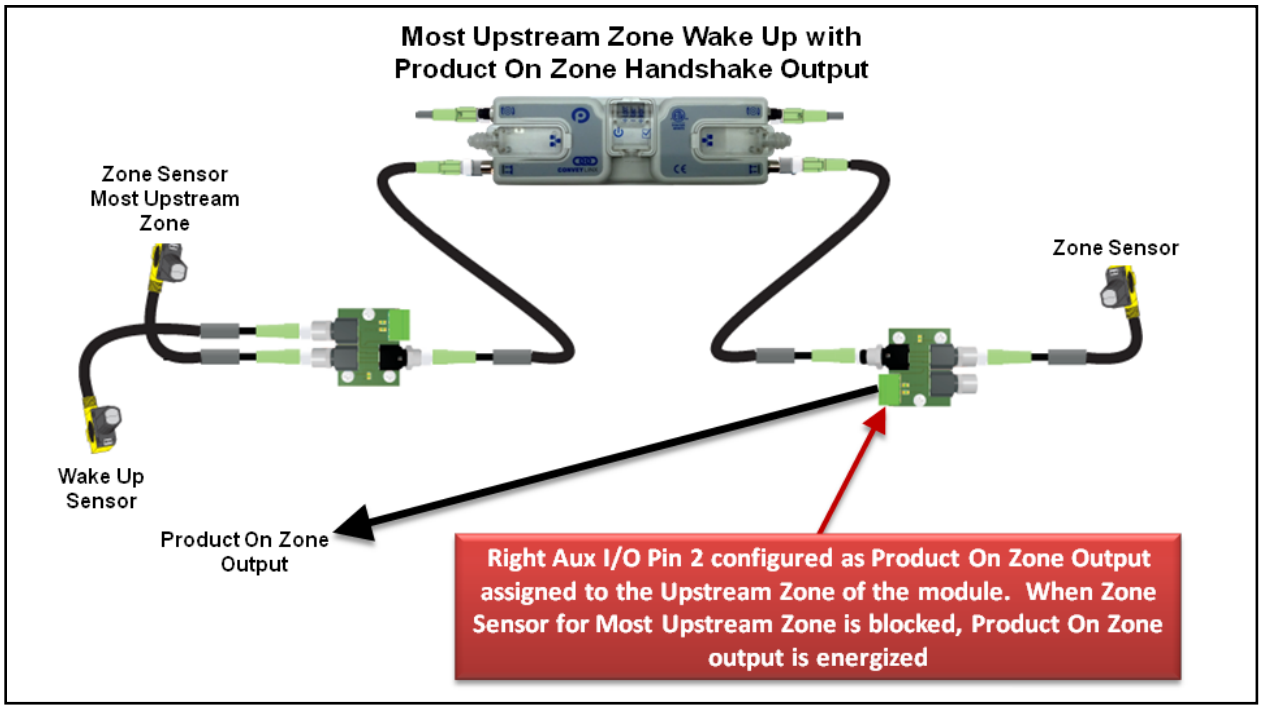


FIGURE 50 - UPSTREAM WAKE UP WITH PRODUCT ON ZONE OUTPUT EXAMPLE

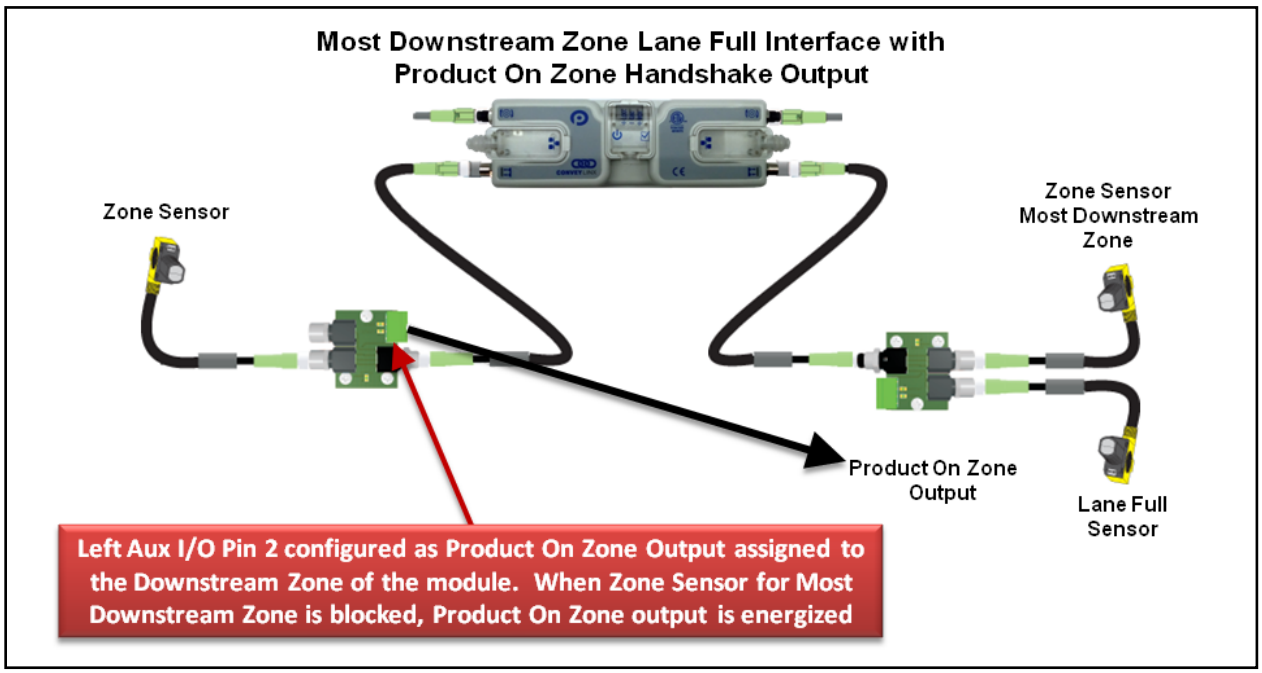


FIGURE 51 - DOWNSTREAM LANE FULL INTERFACE WITH PRODUCT ON ZONE EXAMPLE

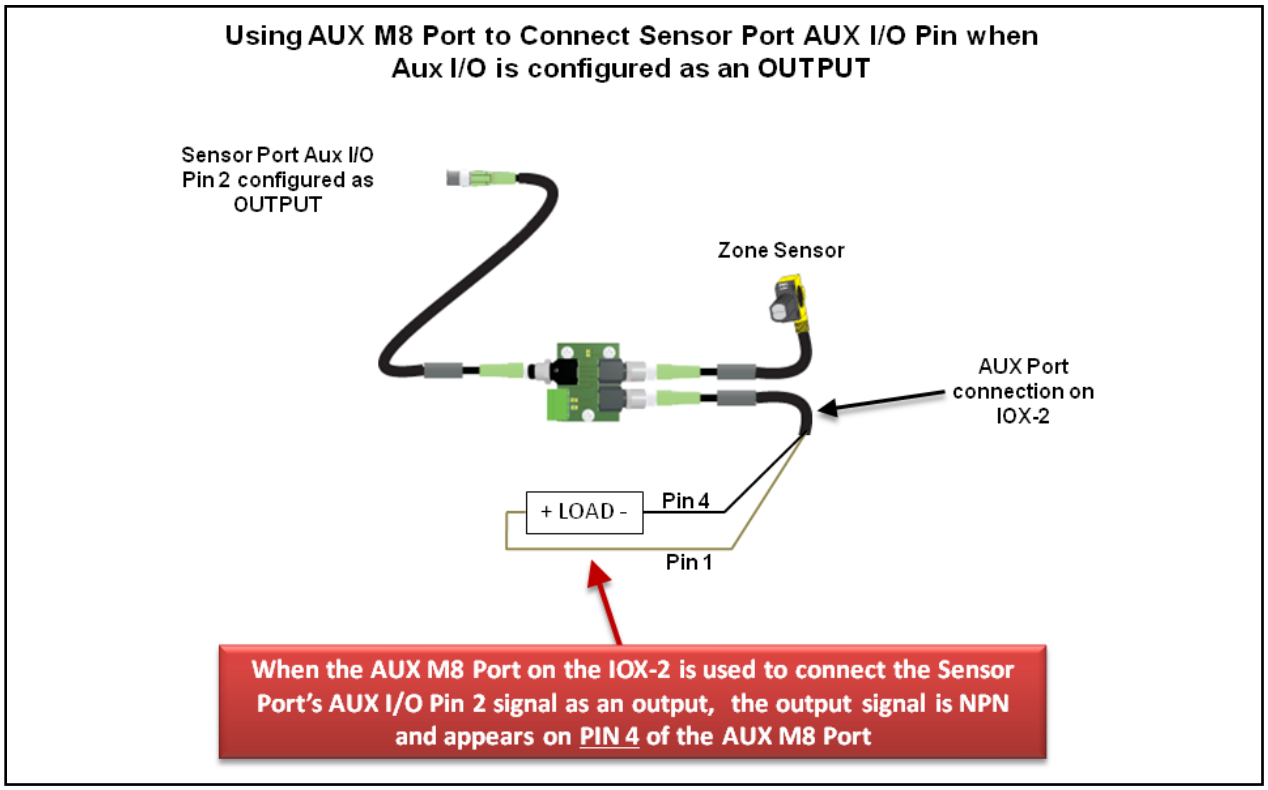


FIGURE 52 - AUX M8 PORT USED AS OUTPUT

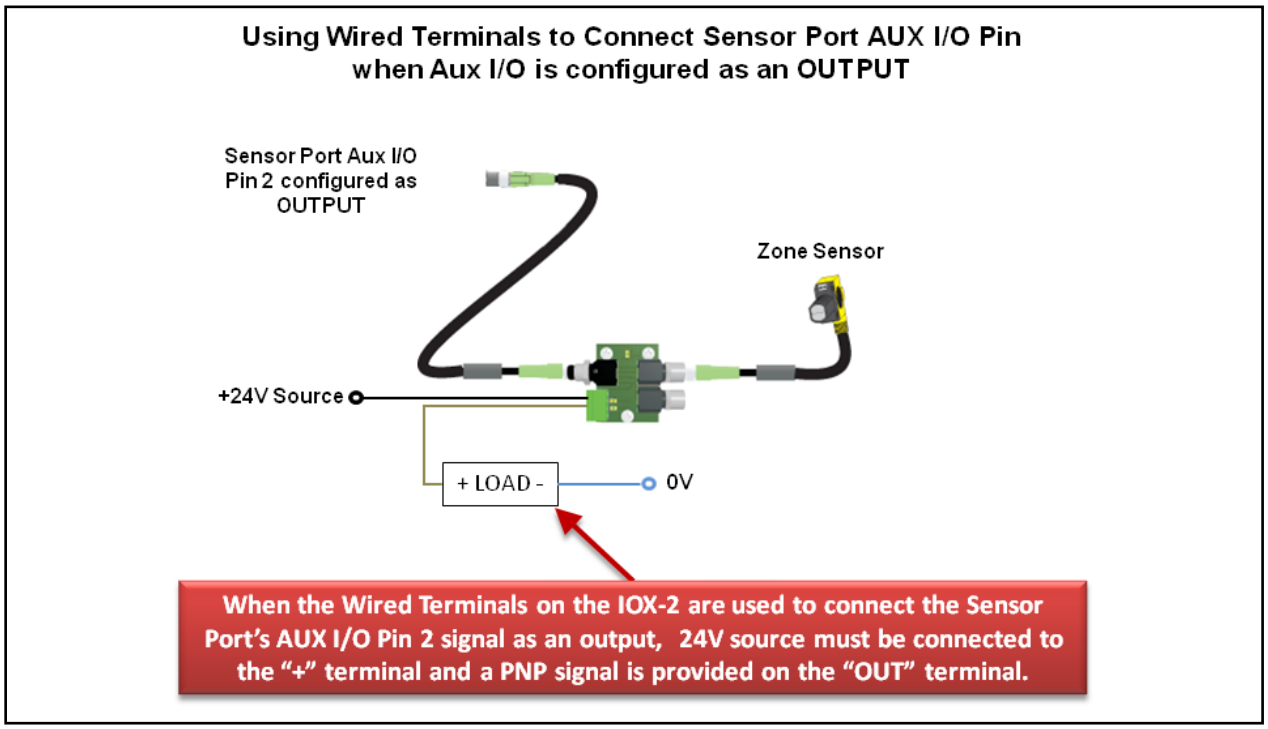


FIGURE 53 - USING WIRED TERMINALS FOR SENSOR PORT AUX I/O CONFIGURED AS AN OUTPUT

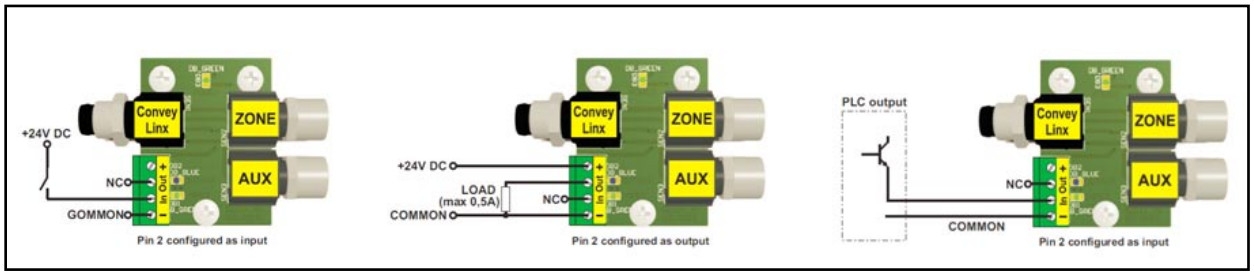


FIGURE 54 - TYPICAL CONNECTION WIRING DIAGRAMS

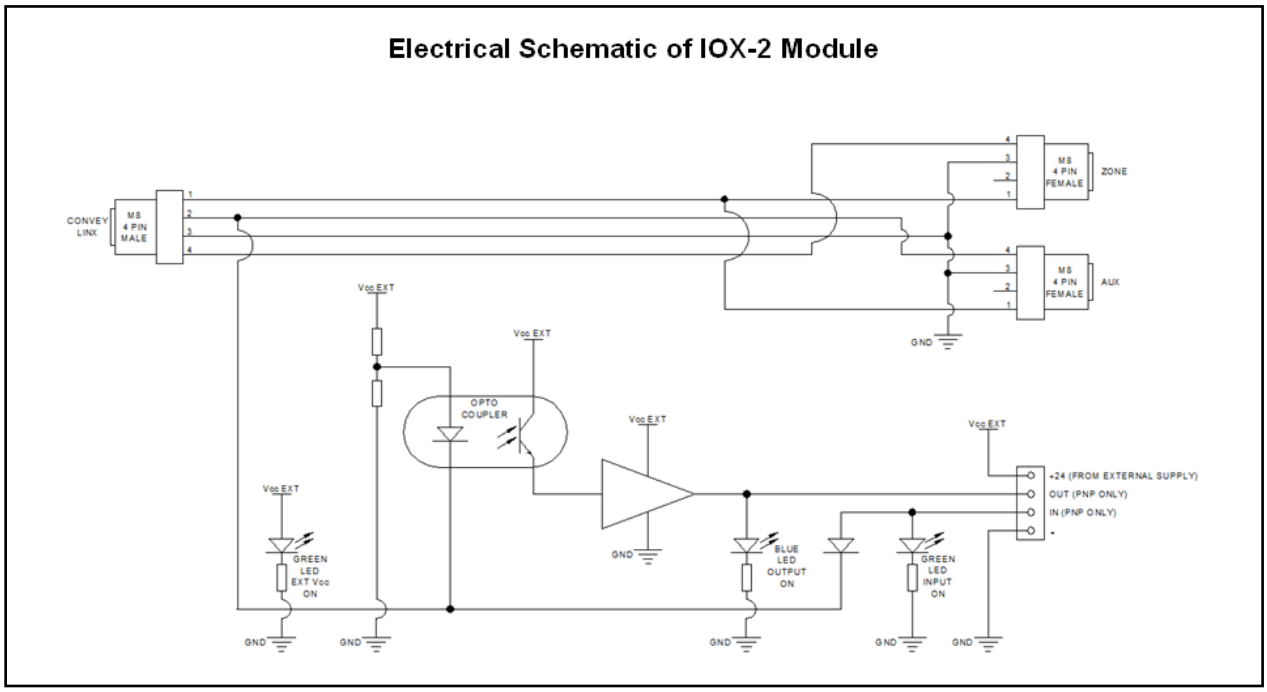


FIGURE 55 - ELECTRICAL SCHEMATIC OF IOX-2 MODULE

APPENDIX C–CONFIGURING PC FOR ETHERNET SUBNETS

CONVEYLINX, IP ADDRESSES, AND SUBNETS

In order to connect to a *ConveyLinx* network and/or utilize and manage a multiple subnet *ConveyLinx* conveyor installation; a certain level of Ethernet I.P. addressing knowledge is required. This reference provides some background information and a quick guide for setting up your PC to be able to take full advantage of *ConveyLinx* and *EasyRoll*.

Your PC's I.P. address is used by an Ethernet network to identify the PC on a network. An I.P. address is constructed of 4 numbers or *octets*. Each of the numbers can be a value from 0 to 255. The format of an I.P. address is:

AAA.BBB.CCC.DDD

Where AAA, BBB, CCC, and DDD can theoretically be any values from 0 to 255 each. For any given network, this I.P. address is unique for each PC on the network. The AAA value identifies the *Class* of the network and is most relevant to I.T. professionals and other entities such as internet providers, etc. For our purposes, we will use a *Class C* type network which uses the value *192* for AAA. For the BBB value we will use *168*. The *192.168* value for the first 2 octets of our I.P. address is the most common for user configurable networks. The values AAA.BBB.CCC together identify the *Subnet* that the PC will be connected. The *Subnet* can be thought of as a group of PC's or *ConveyLinx* modules that can all communicate directly with each other. For example, if a PC's I.P. *Subnet* (AAA.BBB.CCC) address is 192.168.0; then any other PC or device on the same network who's *Subnet* is equal to 192.168.0 can communicate with each other. In this case, our network can have up to 256 devices because the DDD octet has to be in the range of 0 to 255 and each complete I.P. address has to be unique. Any other PC's or *ConveyLinx* modules on our network who's *Subnet* does not equal 192.168.0 will not be able to communicate with each other.

In order to allow your PC to communicate with more than 256 possible address on its network; your PC's I.P. address configuration also uses another 4 octet value known as the *Subnet Mask*. This value allows your PC to see other *Subnets* on the same network.

The following figure shows some typical values for *Subnet Mask* and the resulting number of *Subnets* that can be addressed:

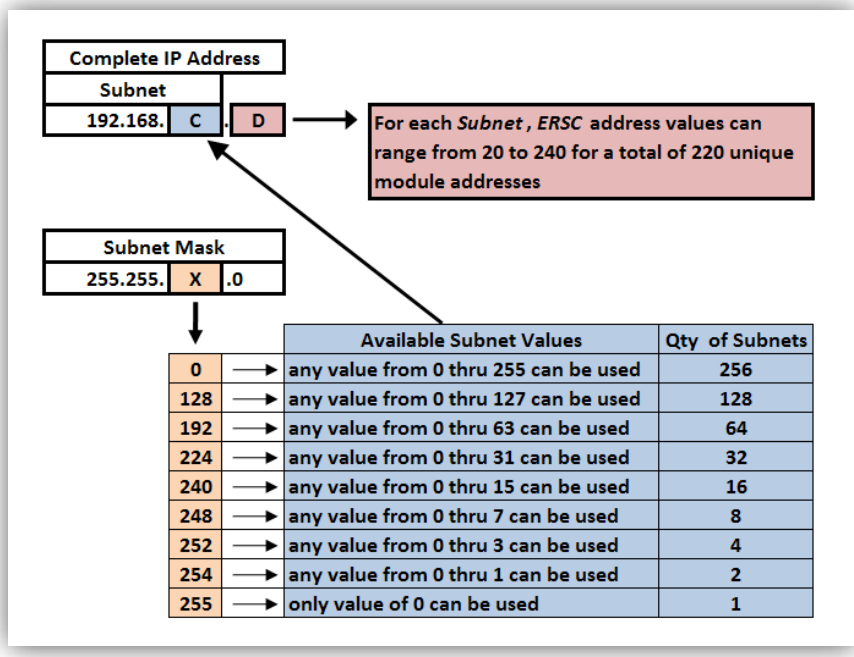


FIGURE 56 - AVAILABLE SUBNETS PER TYPICAL SUBNET MASK VALUES

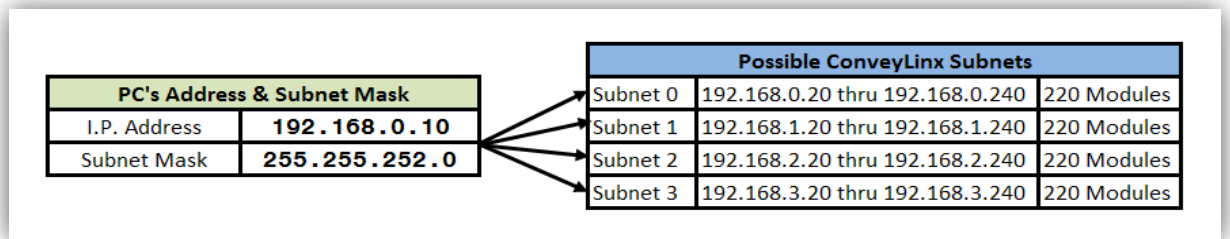
As you can see, by simply manipulating the *Subnet Mask* values, you can configure your PC to see multiple *ConveyLinx* networks.

CONFIGURATION EXAMPLE

Your PC's I.P. address is used by an Ethernet network to identify the PC on a network. For most office networks, the I.P. address is automatically assigned by your office network or in smaller networks (like a home network) the IP address is assigned by a router device. In some cases, your I.T. department may assign your PC or laptop a fixed I.P. address.

For our example we wish to be able to communicate with up to 4 separate *ConveyLinx Subnets*. With a properly configured PC, we can use *EasyRoll* to view and set parameters for all modules on all 4 networks.

The following figure illustrates how we want our PC's I.P. address settings to be configured:



PC's Address & Subnet Mask	
I.P. Address	192.168.0.10
Subnet Mask	255.255.252.0

Possible ConveyLinx Subnets		
Subnet 0	192.168.0.20 thru 192.168.0.240	220 Modules
Subnet 1	192.168.1.20 thru 192.168.1.240	220 Modules
Subnet 2	192.168.2.20 thru 192.168.2.240	220 Modules
Subnet 3	192.168.3.20 thru 192.168.3.240	220 Modules

FIGURE 57 - IP ADDRESS CONFIGURATION EXAMPLE

Please Note: The *ConveyLinx* IP address structure is designed such that all *ConveyLinx-Ai2's* last *octet* (DDD) of their address is greater than or equal to 20 and less than or equal to 240. This leaves 36 spare valid addresses (256 – 220 = 36) on the same *Subnet* for other devices such as PC's and PLC's. In our example, the last *Octet* for the PC's I.P. address is arbitrarily set to 10. This value could be any value from 0 to 19 or 241 to 255. Network conventions are such that on a given *Subnet* the last octet (DDD) values of 0 and 1 are usually reserved for the *Default Gateway* which is often the address of an Ethernet router.

Also note that our example is utilizing all the possible *Subnets* for the Subnet Mask (255.255.252.0) shown. From Figure 56 above; we could have selected any of the values for X on the chart that was listed above the 252 value. In these cases there would simply be more *Subnets* available to address.

APPENDIX D – APPLICATION EXAMPLES

USING EXTENSIONS FOR A LIFT GATE

The most common use of the *Extension* mode configuration available from the *Connections* tab selection is for a powered lift gate. Figure 58 shows a typical powered lift gate example. In this example the *ConveyLinx-Ai2* on the lifting or gate portion of conveyor has 2 MDR's and no photo-sensors. Normal operation when the gate is down is for the MDR's on the gate to run when its immediate downstream zone runs so as to create "one long logical zone". This means that if a load is accumulated on the upstream zone of *Node* 192.168.25.25; a load arriving at the downstream zone of *Node* 192.168.25.23 will stop and accumulate and no loads will ever be logically accumulated or stopped on the gate portion. In order accomplish this we need to first establish the logical flow from 192.168.25.23 to *Node* 192.168.25.25. Secondly, we will then instruct *Node* 192.168.25.24 to be an *Extension* to the upstream zone of *Node* 192.168.25.25.

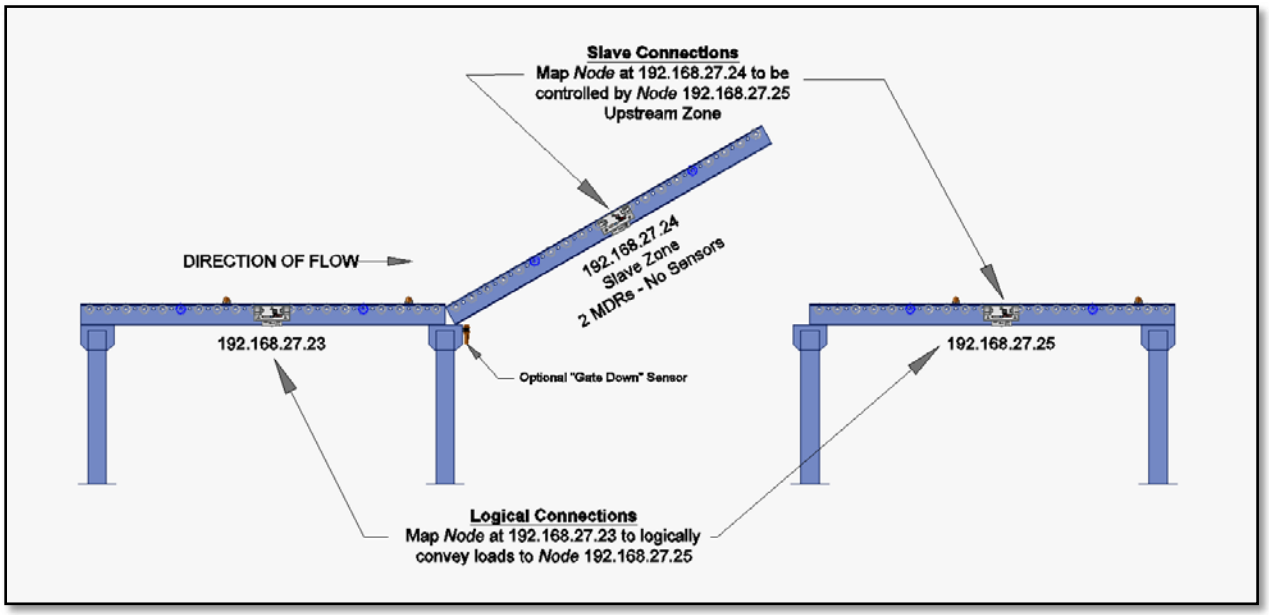
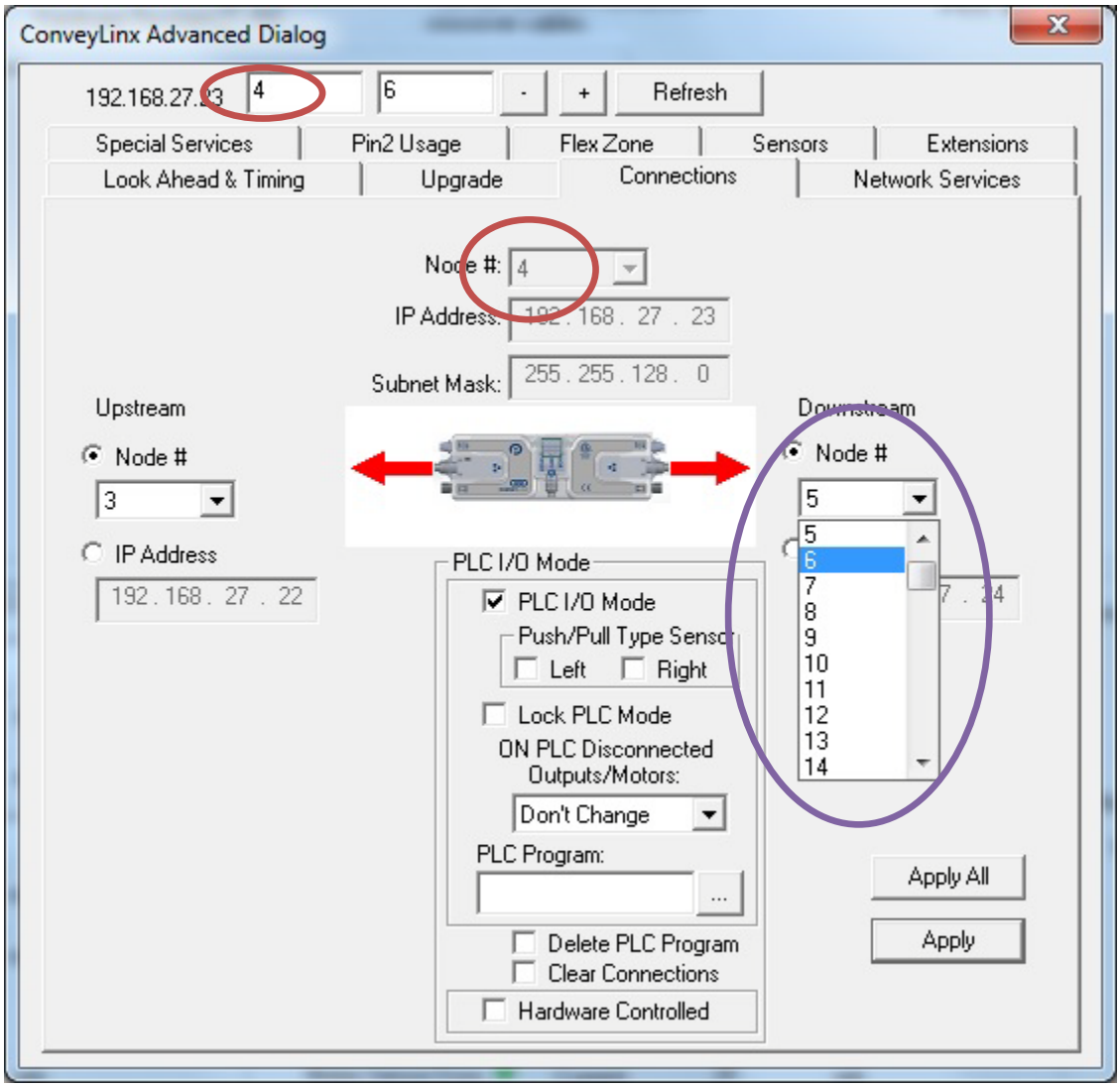


FIGURE 58 - TYPICAL LIFT GATE EXAMPLE

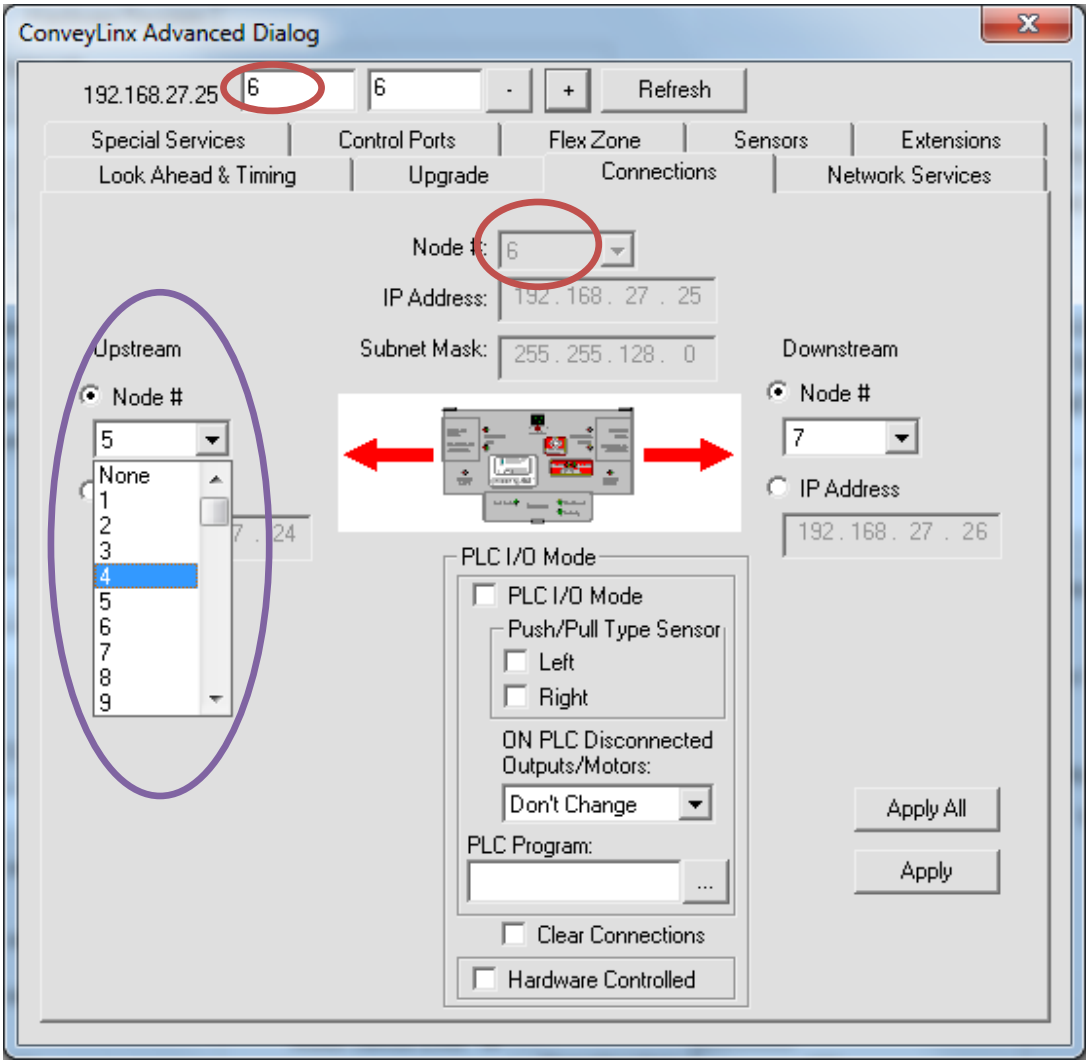
Configure *Node* 192.168.25.23



From the main screen, enter the correct *Subnet* and then select the proper *Node* within the *Subnet*. In this case it is *Node* 4 of *Subnet* 192.168.25. Invoke the *ConveyLinxAdvanced Dialog*. Note that *Node* 4's information is displayed in the center and that it is greyed out.

From the *Auto-Configuration Procedure*, *Node* 4's natural upstream *Node* is 3 and its natural downstream *Node* 5. In this case we want to skip over *Node* 5 because it will be our *Slave* zone. We want *Node 6* to be the *Node* that accepts loads from *Node* 4. Select *Node* 6 from the pull down box and click apply.

Configure *Node* 192.168.25.25

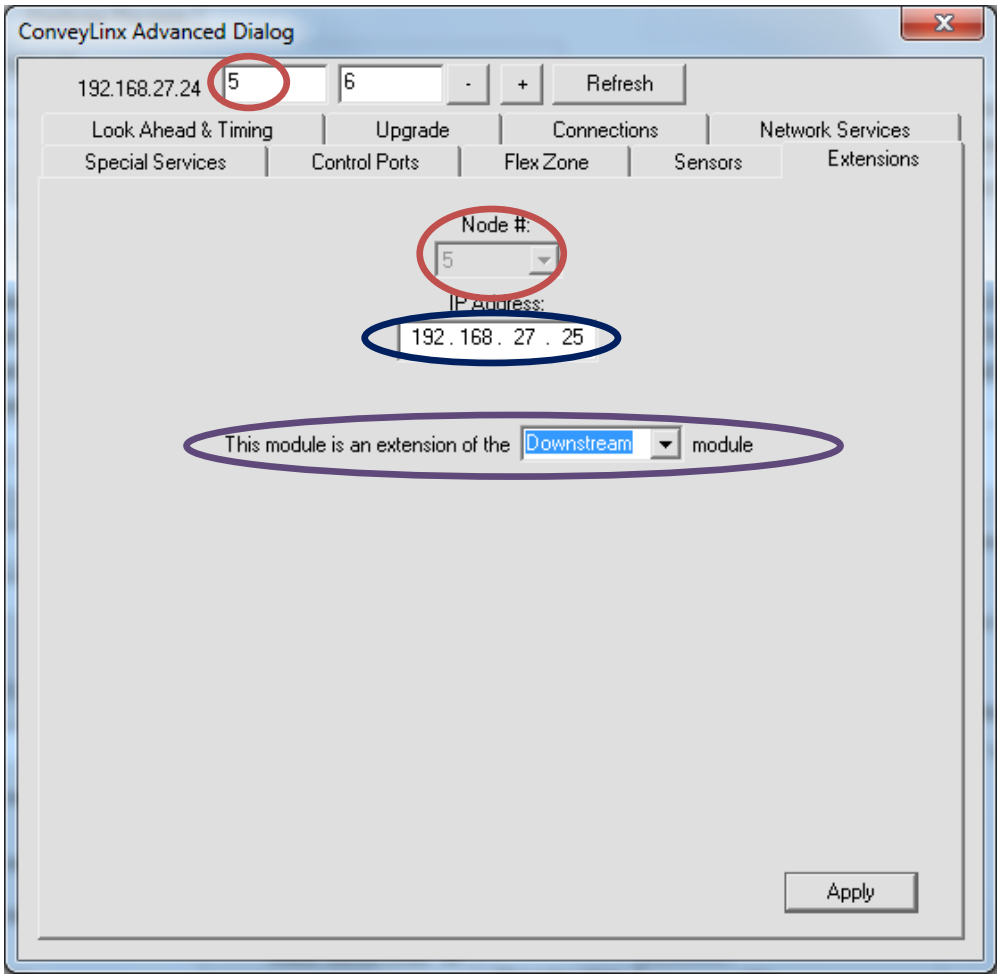


From the main screen, enter the correct *Subnet* and then select the proper *Node* within the *Subnet*. In this case it is *Node* 6 of *Subnet* 192.168.25. Invoke the *ConveyLinxAdvanced Dialog*. Note that *Node* 6's information is displayed in the center and that it is greyed out.

From the *Auto-Configuration Procedure*, *Node* 6's natural upstream *Node* is 5. In this case we want our upstream zone to be fed from *Node 4* instead of *Node* 5 because *Node 5* will be our *Slave* zone. For the Upstream zone, select *Node* 4 from the pull down box and click apply.

The Downstream can remain its default configuration for this application example.

Configure *Node* 192.168.25.24



From the main screen, enter the correct *Subnet* and then select the proper *node* within the *subnet from the main screen or the advanced dialog*. In this case it is *Node* 5 of *Subnet* 192.168.25. Invoke the *ConveyLinx Advanced Dialog and select the extension Tab*. Note that *Node* 5's information is displayed in the center and that it is greyed out.

Pull down the "This Module is an extension of the " " module and select downstream. Click apply.

In Figure 58, there is an optional "Gate Down" sensor shown. This can be provided to hard-wire back to the upstream zone *ConveyLinx-Ai2* (*Node* 192.168.25.23 in our example) to cause the upstream zone just prior to the gate to immediately accumulate product. This sensor device would connect to Pin 2 of the *Sensor* port and the port would need to be configured to "Accumulate" as described in section *Sensor Port Aux I/O* Pin 2 Usage on page 85. For the lift gate example, the sensor device would have to be wired to Pin 2 and be selected to give a signal when the gate is lifted to tell the upstream *ConveyLinx-Ai2* to accumulate. When the gate is down, the device signal should be removed from the *ConveyLinx-Ai2* to instruct its zone to convey as normal.

APPENDIX E – POWER SUPPLY LOADING

The current loading on the power supply for a group of *ConveyLinx* modules depends upon the *Motor Type* selected. Each of the motor types available has an associated rated current that the motor will draw at rated torque and maximum speed. Each motor type also has an associated allowed current draw that is available for a period of time upon the initial starting of the motor. Theses current values and starting times are shown in the following chart:

	ECO	*ECO Plus**	*Boost*	*Boost 8*
Power supply load per Motor Port at rated torque at maximum speed	2.5 A	2.5 A	3.5 A	3.5 A
Power supply load per Motor Port during motor starting period	3.0 A	4.1 A	5.0 A	8.0 A
Duration of motor starting period	5.0 sec.	No time limit	1.5 sec	3.0 sec

*ECO Plus type is only available for firmware version 4.07 and later and EasyRoll version 4.11 and later.

Please note that the current values shown are per Motor Port, so if both Motor Ports are being used on a given ConveyLinx-Ai2 module, the current load seen by the power supply for that module will be double the value shown.

NOTES:

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